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A USER-MANUAL OF THE CDDE/1.0 COMPUTER PROGRAM — OPTIMIZATION OF DRILL LOG DATA ENTRY INTO A COMPUTER DATA BANK

ANDRÉ BOYER AND RUSSELL BOYLE
Ore Reserve Assessment Group
Canadian Mine Technology Laboratory

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MINING RESEARCH LABORATORIES
DIVISION REPORT MRL 87-8 (TR)

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This document is an unedited interim report prepared primarily for discussion and internal reporting purposes. It does not represent a final expression of the opinion of the Canada Centre for Mineral and Energy Technology (CANMET)

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FOREWORD

The most important asset of a mining enterprise is its ore deposit. Unfortunately, the very nature of ore deposits excludes the possibility of exactly defining their valuable contents by conventional measuring techniques. The quantity of the material that can be profitably extracted from an ore deposit cannot be calculated, it must be estimated.

The fundaments of an ore reserves estimation exercise is a data base, consisting of quantitative assaying, surveying and engineering data. The sophistication of ore reserve estimation methodology has rapidly increased in our time, due to advances in computer technology. However, the increasing sophistication of estimation techniques also demands ever larger data bases upon which more dependable estimates of the ore reserves can be built. Yet, accumulation of computerized primary data bases remains an inherently cumbersome and time consuming process.

For over a decade now the Ore Reserve Assessment Group (ORAG) of CANMET's Mining Research Laboratories (MRL) accumulated a very extensive primary data base of the Canadian uranium deposits by various hand-coding techniques. The purpose was to use this data base in conjunction with computerized ore estimation techniques. ORAG developed such a computerized technique, referred to as the **CADD/GEM** system. To use this computer technique, a large amount of basic data must be entered. This report describes in an easily understood manner, how to do this with the **CDDE/1.0** program. It is a fast, user friendly and menu driven program, which makes it very suitable for use by personnel in the mining industry.

This manual is constantly used by ORAG in its daily work. It is published herewith in a readily accessible form, in order that it become a valuable tool for any mining or mineral exploration company.

John E. Udd
Director
Mining Research Laboratories

AVANT-PROPOS

La plus important acquisition pour une compagnie minière est son dépôt minéral. Cependant, de par la nature même d'un dépôt minéral, il est impossible de quantifier exactement son contenu par les techniques de mesure conventionnelles. Donc, on peut seulement estimer la quantité de matériel qui peut être extraite avec profit d'un dépôt minéral.

Le matériel de base, pour l'estimation des réserves de minerai, est une banque de données, qui comprend les valeurs quantitatives telles que les essais, l'arpentage et les données d'ingénieur. La sophistication de la méthodologie reliée à l'estimation des reserves de minerai a évolué rapidement de notre temps. Ceci est entièrement relié à l'avènement de l'ordinateur. Aussi, la sophistication des techniques d'estimation demande également des banques de données plus grandes, ce qui permet de faire des estimés plus fiables. Il reste que l'accumulation des données primaires informatisées est un procédé ennuyant et long.

Il y a maintenant plus d'une décade que le Groupe d'évaluation des réserves de minerai (ORAG) du Laboratoire de Recherche Minière (LRM) du CANMET a commencé d'accumuler une banque de données primaires très élaborée et informatisée des dépôts d'uranium canadien en utilisant plusieurs méthodes manuelles d'entrée de données. La raison était d'utiliser ces données de base en conjonction avec les techniques d'estimation informatisées. ORAG a développé sa propre technique informatisée pour l'entrée des données. C'est une méthode rapide, d'utilisation facile, ce qui en fait une méthode pratique pour le personnel utilisateur de l'industrie minière, qui doit optimiser l'utilisation de quantité énorme d'information. Ce rapport décrit, d'une manière facile à suivre, comment le faire.

Ce manuel est utilisé quotidiennement par ORAG. Il est publié, ici, sous un format accessible pour le lecteur, de façon à devenir un outil valable pour toutes compagnies minières ou d'exploration désireuses d'utiliser une technique semblable.

John E. Udd
Directeur
Laboratoires de recherche minière

A USER-MANUAL OF THE CDDE/1.0 COMPUTER PROGRAM — OPTIMIZATION OF DRILL LOG DATA ENTRY INTO A COMPUTER DATA BANK

by

André Boyer* and Russell Boyle**

ABSTRACT

The Ore Reserve Assessment Group (ORAG) of Canada Centre for Mineral and Energy Technology (CANMET) developed a major computer program called **CDDE/1.0**. It facilitates and optimizes the speed of drilling data entry, as well as its validation, into a computer data bank.

The interactive, menu driven, user friendly computer program is based on a rapid question and answer sequence. During this sequence drilling information is entered into pre-programed forms, which appear on the terminal screen.

The program is written in VAX-11 Fortran language and runs on a VAX 11/750 VMS type mini-computer.

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MANUEL POUR L'UTILISATEUR DU PROGRAMME CDDE/1.0 — OPTIMISATION DE L'ENTRÉE INFORMATISÉE DES DONNÉES DE FORAGE

par

André Boyer* and Russell Boyle**

RÉSUMÉ

Le Groupe d'évaluation des réserves de minerai (ORAG) du Centre canadien de la technologie des minéraux et de l'énergie (CANMET) a developpé un logiciel majeur appelé **CDDE/1.0**. Il a été conçu pour faciliter et optimiser la vitesse d'entrée informatisée des données de forage.

Ce logiciel est basé sur une séquance rapide de questions et réponses s'exécutant d'une façon interactive et facile pour l'usager. Durant cette séquance, l'information des forages est entrée sur des formulaires préprogrammés, qui apparaissent au bas de l'écran du terminal.

Le logiciel est écrit dans le language Fortran VAX-11 et s'exécute sur le mini-ordinateur VAX 11/750 VMS.

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BACKGROUND

As mentioned in earlier ORAG reports [e.g., Sabourin (1983b)], planning or expanding a mine is an expensive, time consuming job. It draws on the skills of many different earth science professionals — including mining engineers, geostatisticians and geologists — who first have to gather geological information from drillholes to calculate a site's potential. Before the advent of the computer, data were plotted manually, and assessment could take months. But now improved computer software can slice by more than 25% the time for reserve evaluation studies, liberating geologists from the cumbersome task of manually filing and correlating information.

However, as also stated, a mine's feasibility is broadly based on the size and grade of its orebody, the capital and operating costs, and the market price for the resource. But evaluating a resource is no straight line equation. Ore bodies vary in size, location, grade, contaminants, depth and terrain — a complex matrix of variables. Mining professionals have, therefore, developed a range of computer software to handle all these variables. A number of these software packages was developed by ORAG* — a special group of the Canada Center for Mineral and Energy Technology (CANMET) — to evaluate Canada's *reasonably assured uranium resources* and more recently the coal deposits of southern Saskatchewan.

Two groups of programs, the *Coding and Analysis of Drillhole Data* (CADD) and the *Geostatistical Evaluation of Mines* (GEM) were developed in tandem. The CADD system codes, edits, corrects and prepares drillhole data for evaluation; it was in place by the end of 1976. The GEM system takes CADD files and, chunk by chunk, refines them using geostatistical as well as other more traditional resource evaluation methodologies. For further information of these two systems, see Sabourin (1983a) and Sabourin (1983b). The *TOPICS* and *TITLES* of the 25 programs involved in these systems were listed by Boyer (1985, pp.A6 to A10). In essence these computer programs can: prepare drill log reports; calculate economical composite intersections; draw projections of drillholes on sections or plans; calculate experimental variograms; find the best theoretical model; perform kriging evaluations as well as conventional type evaluations; and draw isocurves.

Any one of the above mentioned results are computed on the basis of drillhole data which, in turn, have previously been entered into the computer data bank by means of the **CDDE/1.0** program described in this report.

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* ORAG: Ore Reserve Assessment Group

INTRODUCTION

The analysis of large amounts of drillhole data is required to perform valid ore reserve calculations.

Ore reserve calculation methodologies progressed rapidly with the development of the computer. Thereby it became possible to perform complex geostatistical calculations, graphics, and other drilling data related processing steps. However, data entry into the previous generation of computers remained a time consuming and cumbersome process. Initially, drillhole data had to be entered manually, involving both coding sheets and a large amount of keypunch cards.

Today, with the most recent generation of computers, it is possible to develop interactive, menu driven, user friendly software. Such software was developed by ORAG† for drillhole data entry into computer disk files. It is called the **CDDE/1.0**‡ program. This report is the program's user-manual. It describes the computer-aided procedure for interactive drilling data entry and the data validation process. Moreover, it is useful as a reference manual for anyone who might wish to develop a similar computer program to handle geological and exploratory data base systems.

The **CDDE/1.0** program was developed by ORAG to satisfy their data entry requirements into a data bank required to feed the CADD/GEM* system (Sabourin, 1983). The aim was to produce a computer program to replace ORAG's earlier cumbersome and time consuming system, which involved manual coding and keypunched computer cards.

Any standard drilling data normally used by mining geologists can be entered into ORAG's present system. Preferably these data should include information obtained from drillholes and drillhole cores, such as:

- drillhole collar location
- drillhole deviations
- drill core density
- percent core recovery
- chemical assays of core, and/or radiometric readings
- simple geological, lithological and structural information

---

† ORAG: Ore Reserve Assessment Group
‡ CDDE/1.0: Computer Drilling Data Entry/Version 1.0
* CADD/GEM: Coding and Analysis of Drillhole Data / Geostatistical Evaluation of Mines

PROGRAM TASKS, CONCEPTS and CHARACTERISTICS

The **CDDE/1.0** program's task is to replace ORAG's earlier cumbersome and time consuming data entry process with a fast, user friendly, interactive, menu driven program.

The concept of the **CDDE/1.0** program follows the steps originally taken by the company geologist when first preparing the drillhole log report. Consequently, the sequence of the menu driven data entry is in line with these logging steps.

The **CDDE/1.0** program characteristics are designed to utilize standard drillhole information, used by mining geologists to estimate the reserves of uranium and/or thorium deposits, and their associated by-product(s). These characteristics also allow for a very rapid data entry and validation process:

— by utilizing the *distance from the collar* as basic program information;

— by entering data columnwise, rather than rowwise;

— by having a program provision to enter repetitive data extremely rapidly;

— by having a program provision to rapidly correct errors of commission and/or omission.

The general characteristics of the program are as follows:

— a string of messages appear on the terminal screen prompting the user to *start, continue, interrupt* the data entry procedure, and/or to *enter* the appropriate drillhole data;

— wherever data coding is required, the *Appendices* of this report provide the necessary information;

— the data entry procedure is based on completion of five principal forms, namely of forms *TITLE, DAMH, TYPEA DATA, TYPEB DATA* and of *TYPE OTHER METALS*. These appear on the terminal screen at the appropriate junctures;

— after completion of each form, and again at the completion of all the forms, the user has an opportunity to *view, correct, modify* the completed form(s), and/or to *proceed*;

— in order to *store* in a direct access file the data entered, the user must complete all program steps. After data storage, no more data modification is possible.

IMPORTANT INFORMATION BEFORE USING THE CDDE/1.0 PROGRAM

Data Entry Related Requirements

In order to use the **CDDE/1.0** program, the input data must, as a minimum, include the following information:

- all relevant data, at a full range of distances from the drillhole collar. These data should include information such as: a dip and azimuth survey of a drillhole and its deviations; chemical core-assays; percent core recovery,
- appropriate codes, assigned to the given data, wherever needed, as per the guide-book for the CADD/GEM system (Sabourin 1982).

Computer Related Requirements

The program was written in VAX-11 Fortran language and can, at this time, only be run on a VAX 11/750 VMS computer.

Program execution requires the following VAX hardware and software:

- VAX computer,
- VMS 4.4 operating system,
- 1 Mbyte memory,
- either a VT 100, or a VT 200 series terminal,
- VAX Fortran compiler (optional).

The **CDDE/1.0** program involves the following restrictions:

- a limit of 600 segments* per drillhole,
- a limit of 96 dip and azimuth measurements of the drillhole (due to the design of form *DAMH*).

---

* A segment is defined as a basic unit length of a drillhole core, usually expressed in meters or feet, as established by the geologist.

It should also be remembered that the maximum number of drillholes which can be entered depend on the amount of space available on the computer hard disk(s). Moreover, should it be desired to run the program on other hardware configurations, the present software will have to be modified.

General Remark

The authors believe that the prospective users of program **CDDE/1.0** will find it advantageous if, while reading this report, they will concurrently perform the appropriate steps on their terminal. *Appendix F*, with an appropriate example, should be of particular interest.

DRILLING DATA ENTRY PROCEDURE

- **GENERAL**

This section provides details of how the user is to proceed at the computer terminal. It may be noted, in general terms, that at each step during program execution instructions appear on the terminal screen. They ask the user to enter one of the alternative options displayed on his screen.

Step 1:

Accessing the program (valid for CMTL † internal use only)

After logging in, type:

@ program

and **R** *

The screen now displays a full range of programs available to ORAG within CMTL on the VAX.

Select program no 2, by typing **2** and **R** . This enters the program of current interest, namely **CDDE/1.0** (*Coding Drilling Data*)

Step 2:

Identification of the File Name

At this point the screen displays Fig. 1.

Now type the preselected file name. This name is limited to 40 characters which can contain both letters and figures. It is advisable to incorporate into this name reference to the MEG‡ deposit identification and to the number of drillholes expected to be entered into the file. As an example, type:

ATT_1to100.data

Now type **R**

---

† CMTL = Canadian Mine Technology Laboratory
* **R** indicates that the *RETURN* key is to be pressed
‡ MEG = Mine Evaluation Group, now ORAG.

PROGRAM DRILLHOLE CODING
ENTER THE FILE NAME OF DRILLHOLES:

Fig. 1. Screen display for step 2

Step 3:

Determination whether Step 2 file name is a new one

At this point the screen displays Fig. 2.

Now type either **N** and **R**

or **O** and **R**

or **R**

as required (it is the user's responsibility to choose the correct answer).

Note:

N is selected to create a new file. Should this name have been used previously, a new version of the file will be created.

O is selected to continue with an existing file. Should a non-existent file name be used an error message appears and the cursor automatically returns to its previous position.

If **R** is selected, the program reverts to step 1.

Otherwise step 4 follows.

Step 4:

Determination whether drillhole (DH) now being filed is a new one or continuation of a previously filed DH.

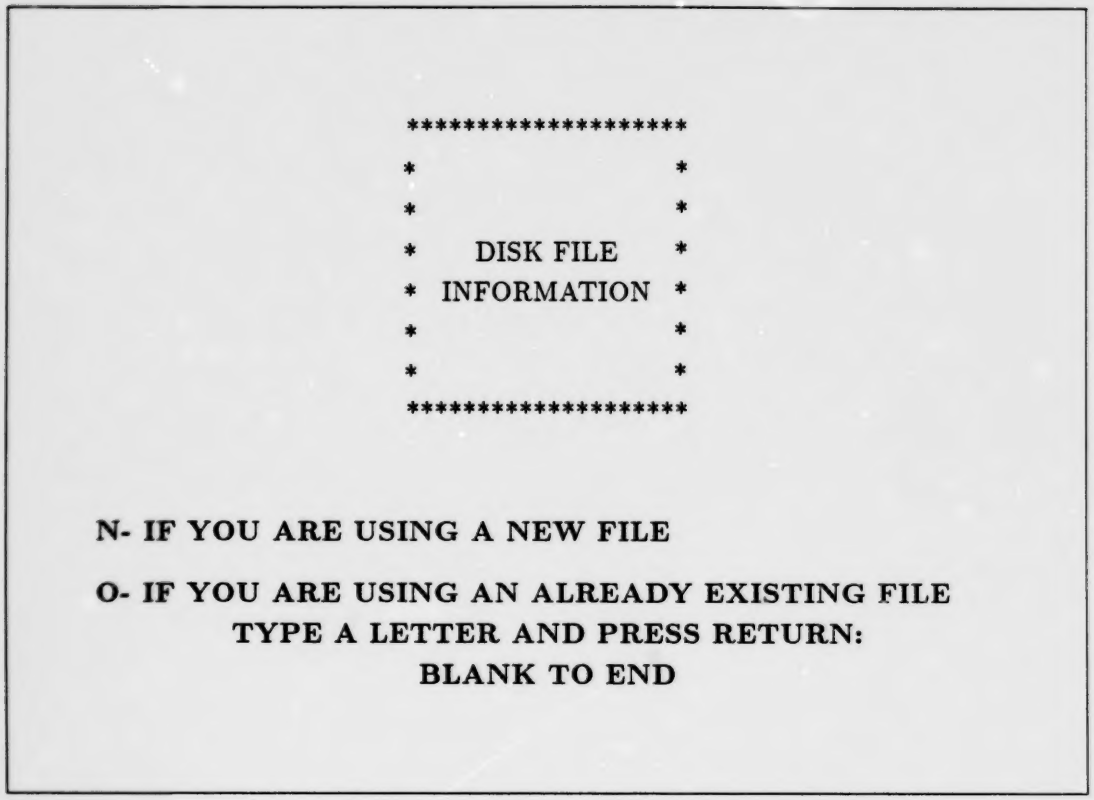
DISK FILE
INFORMATION
N- IF YOU ARE USING A NEW FILE
O- IF YOU ARE USING AN ALREADY EXISTING FILE
TYPE A LETTER AND PRESS RETURN:
BLANK TO END

Fig. 2. Screen display for step 3

At this point the screen displays Fig. 3.

Now type either **C** and **R**

or **S** and **R**

or **N** and **R**

as required (it is the user's responsibility to choose the correct answer).

Note:

if **S** is selected before completion of the most recently filed DH, an error message appears, and the cursor automatically returns to its previous position. The unfinished

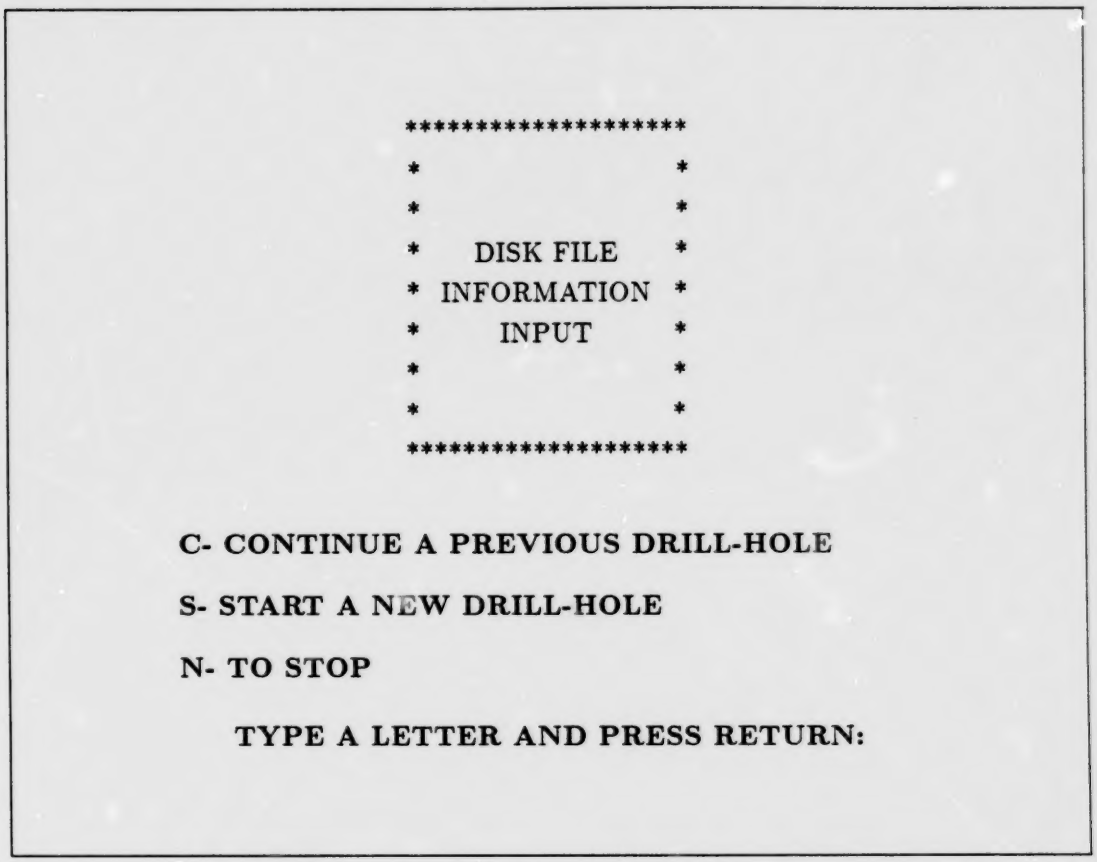

Fig. 3. Screen display for step 4

DH must be completed before **S** can be selected.

C will give the same error message, if the most recently filed DH was in fact completed.

If **N** is selected, the program reverts to step 1.

- **FORM** *TITLE*

Step 5:

Information identifying the form which will be displayed on the screen in step 6.

This form is called *TYPE = TITLE* (as on p. 25 of Sabourin 1982).

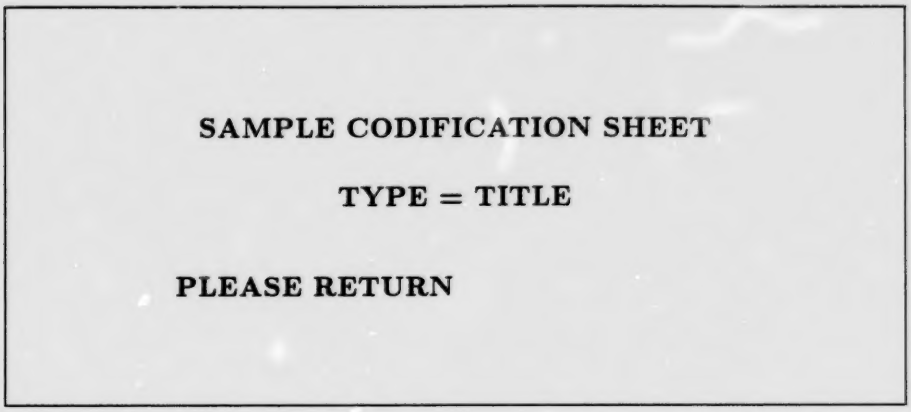

Fig. 4. Screen display for step 5

At this point the screen displays Fig. 4.

Now type **R**

Step 6:

Data entry

At this point the screen displays Fig. 5.

Now fill in this form called *TITLE* [entries (1) to (24)], as explained in *Appendix A*. This procedure is based on (Sabourin, 1983, pp. 4 to 10).

After completion of *Entry (24)* type **R**.

This moves the cursor to the end of the bottom line on form *TITLE*.

If errors are detected at this point, type the entry number and than type **R**. This moves the cursor to the desired entry. The correct information must now be entered, as if the previous entry did not exist (it disappears automatically when entering the new data).

Now type **R**. The cursor reverts to the end of the bottom line on form *TITLE*.

The foregoing error correction procedure may be repeated as often as is necessary. When all errors have been corrected, type **R**.

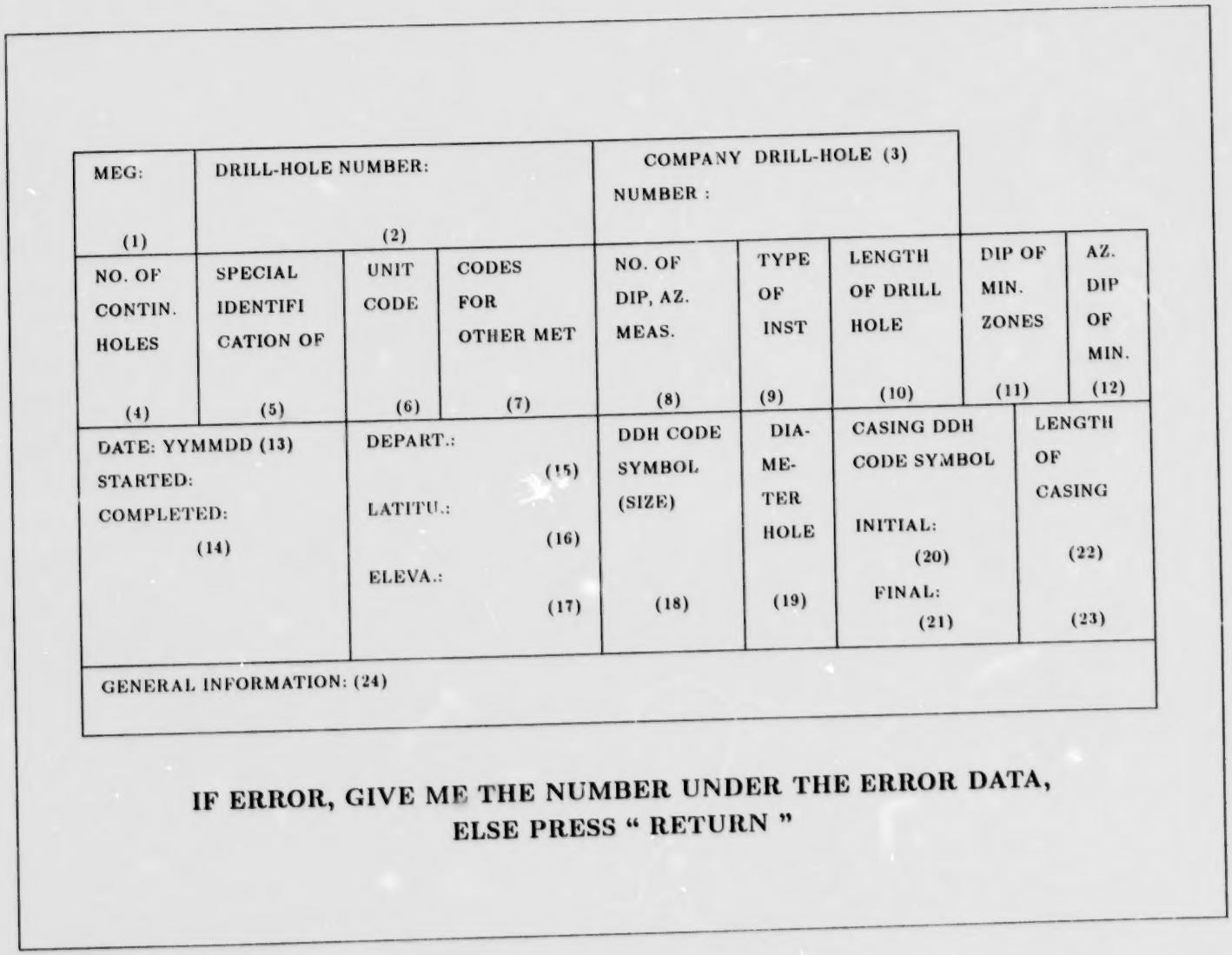

Fig 5. Screen display for step 6: form *TITLE*

Step 7:

Provision of option to continue or to interrupt the procedure

At this point the screen displays Fig. 6.

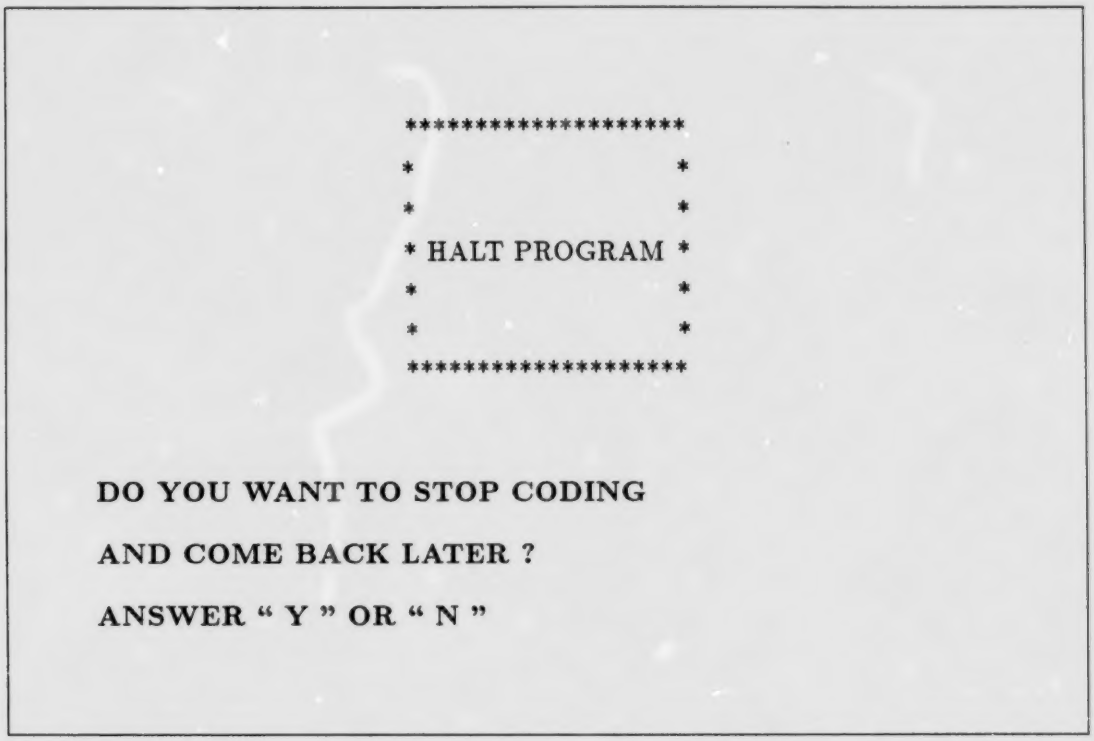

Fig. 6. Screen display for step 7

Now type either **Y** and **R**

or **N** and **R**

as required.

If **Y** is selected, the file completed up to this point is saved, and the program reverts to step 1, with the full range of available (to CMTL) programs reappearing on the screen.

Now the user may either type **EXIT**, or choose another program.

If **N** is selected, step 8 follows.

- **FORM** *DAMH*

Step 8:

Information identifying the form which will be displayed on the screen in step 9

This form is called TYPE =DAMH (as on p. 37 of Sabourin 1982)

At this point the screen displays Fig. 7.

SAMPLE CODIFICATION SHEET

TYPE = DAMH

PLEASE RETURN

Fig. 7. Screen display for step 8

Now type **R**

Step 9:

Data entry

At this point the screen displays Fig. 8.

Now fill in this form called DAMH, as explained in *Appendix 'B'*. This procedure is based on (Sabourin, 1982, pp. 10 and 11).

After completion of the fifth column of form DAMH, typing of **R** (for the last time) makes Fig. 9 appear on the screen.

LINE NUMBER	DIST. FROM COLLAR TO MEASUREMENT	DIP MEASUREME. OF HOLE	AZIMUTH MEASUREME. OF HOLE	COMMENTS
4				

ENTER THE DISTANCE FROM COLLAR TO MEASUREMENTS; EX: "123456.7"

Fig. 8. Screen display for step 9: form *DAMH*

Note:

form DAMH only appears in step 9, if, in entry (8) of *Appendix 'A'*, a number greater than 1 was typed. Otherwise the program advances to step 12.

Step 10:

Selection of type of correction required (in step 11) on form DAMH

At this point the screen displays Fig. 9.

Now type either **C** and **R**

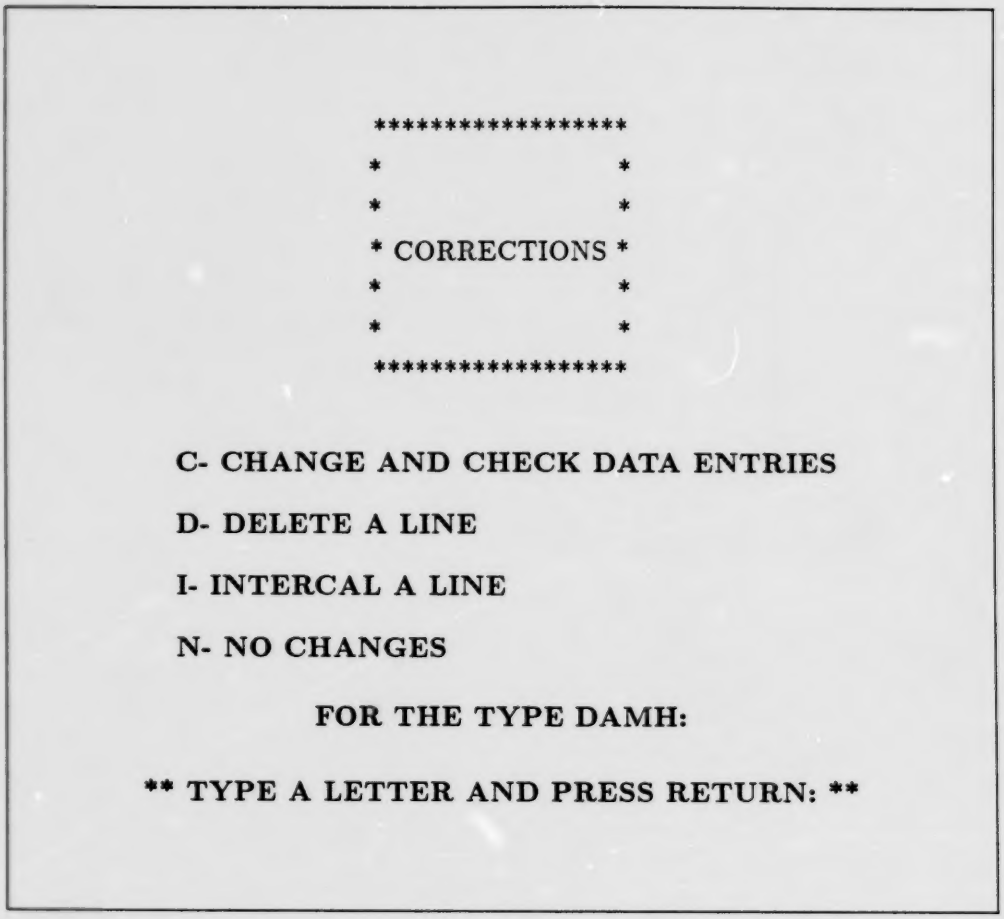
CORRECTIONS
C- CHANGE AND CHECK DATA ENTRIES
D- DELETE A LINE
I- INTERCAL A LINE
N- NO CHANGES
FOR THE TYPE DAMH:
** TYPE A LETTER AND PRESS RETURN: **

Fig. 9. Screen display for step 10

or **D** and **R**

or **I** and **R**

or **N** and **R**

Note:

— *INTERCAL* means *INSERT*

— unless **N** is selected, step 11 follows on typing **R**. If **N** is selected, the program advances to step 13.

Step 11:

Selection of line location for the first correction on form DAMH

At this point the screen displays Fig. 10.

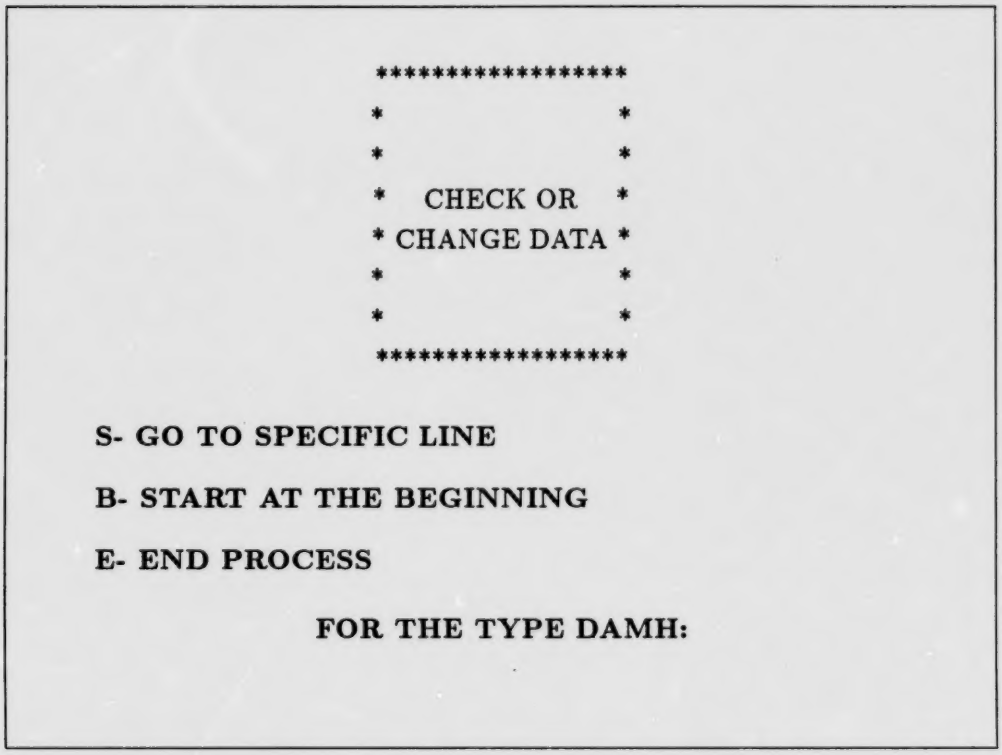

Fig. 10. Screen display for step 11

Now type either **S** and **R**

or **B** and **R**

or **E** and **R**

Note:

if **E** is selected, the program reverts to step 10 (and Fig. 9 on the screen).

If either **S** or **B** are selected, the program advances to step 12.

Step 12:

Correction of errors in form TYPE = DAMH

At this point the screen displays Fig. 8, as previously completed in step 9, together with appropriate instructions for effecting the necessary corrections. Several correction procedures exist. These are:

Procedure (a1):

If **C** and **B** are selected in Fig. 9 and Fig. 10 (steps 10 and 11 respectively), Fig. 8 reappears with the following message:

Message 1:

IF ERROR, ENTER THE LINE NUMBER: AND THE COLUMN NUMBER:

WHICH CONTAIN THE ERROR, ELSE PRESS "RETURN"

The line and column numbers, plus **R** will now have to be entered as often as corrections remain to be made.

On typing **R** after the last correction, Fig. 10 reappears.

Procedure (a2):

If **S** is selected in step 11, instead of **B**, a blank Fig. 8 reappears with the following message:

Message 2:

SELECT CODED DISTANCE FROM COLLAR

TO END ENTER "9999.9" AND PRESS RETURN

On typing **9999.9**, the program reverts to step 11.

On typing the appropriate *Distance from Collar* entry and **R**, Fig. 8 reappears complete with all data previously entered, plus the following message:

Message 3:

ARE YOU ON THE RIGHT PAGE ?

ANSWER "Y" OR "N"

If **Y** is selected, message (1) reappears and the user can proceed with the necessary corrections.

If **N** is selected, message (2) reappears. From here on the process repeats itself, as explained above.

On typing **R** after the last correction, Fig. 10 reappears.

Procedure (a3):

If **E** is selected in step 11, instead of **B** or **S**, Fig. 9 reappears (step 10).

****

Procedure (b1):

If **D** and **B** are selected in Fig. 9 and Fig. 10 (steps 10 and 11 respectively), Fig. 8 reappears with the following message:

Message 4:

DO YOU WANT TO ELIMINATE A LINE ?

ANSWER "Y" OR "N"

If **Y** is selected, the following message appears:

Message 5:

ENTER THE NUMBER OF THE LINE TO DELETE

After typing the appropriate *Line Number* and **R**, the line in question is automatically deleted, and the following message appears:

Message 6:

DO YOU HAVE AN OTHER LINE TO ELIMINATE ON THIS PAGE?

ANSWER "Y" OR "N"

If **Y** is selected, message (5) reappears; from here on the process repeats itself as explained above.

If **N** is selected, either for messages (4) or (6), Fig. 10 reappears. The user can now either repeat procedure (b1), or select **E**.

Procedure (b2):

If **S** is selected, instead of **B** in step 11, message (2) appears. After replying to it, message (4) appears and from here on the process repeats itself as explained above.

After the last *elimination* of a line and on typing **N** and **R** (in reply to message 6), Fig. 10 reappears. The user can now either repeat procedure (b1) or (b2), or select **E**.

Procedure (b3):

If **E** is selected in step 11, instead of **B** or **S**, Fig. 9 reappears (step 10).

****

Procedure (c1):

If **I** and **B** are selected in Fig. 9 and Fig. 10 (steps 10 and 11 respectively), Fig. 8 reappears with the following message:

Message 7:

DO YOU HAVE A LINE TO INSERT IN THE PAGE?

ANSWER "Y" OR "N"

If **N** is selected, Fig. 10 reappears and the user now reverts to step 11.

If **Y** is selected, the following message appears:

Message 8:

SELECT CODED DISTANCE FROM COLLAR ENTER NO. OCCURENCE?(1OR)

TO END, ENTER "9999.9" PRESS RETURN

The possibility of entering **9999.9** is provided here, so that the user can revert to step 11 without having to answer messages (9) to (12), even if he has entered **Y** in reply to message 7.

It should be noted that after entering the appropriate *Distance from Collar* (which must be one of the data displayed), a **1** must always be added as the appropriate *No. Occurence*. On typing this **1** and an **R**, the following message appears:

Message 9:

DO YOU WANT TO INSERT BEFORE OR AFTER THAT COLLAR?

ANSWER "A" OR "B"

Note that **A** refers to *AFTER* and **B** to *BEFORE* the *Distance from Collar* length specified in message 8.

On typing **A** or **B** and **R**, the following message appears:

Message 10:

WRITE THE COMPLETE LINE, AND PRESS RETURN FOR EACH DAMH DATA

REENTER THE COMMENTS

Note that *EACH DAMH DATA* means: type **R** after having completed an entry in the respective column.

On typing the last entry of the line and **R**, the following message appears:

Message 11:

IS THE LINE READY TO BE ENTER?

ANSWER "Y" OR "N"

If **N** is selected, message (10) reappears and the user has an opportunity to retype the entire line of entry.

If **Y** is selected, the following message appears:

Message 12:

DO YOU HAVE ANOTHER INTERCALLATION FOR THE PAGE?

ANSWER "Y" OR "N"

Note that *INTERCALLATION* means *LINE INSERTION.*

If **Y** is selected, message (8) reappears; from here on the process repeats itself as explained above.

On typing **N** and **R**, after the last *Line Insertion*, Fig. 10 reappears, and the user

now reverts to step 11.

Procedure (c2):

If **S** is selected, instead of **B** in step 11, message (2) appears.

On typing **9999.9**, the program reverts to step 11.

On typing the appropriate *Distance from Collar* entry and **R**, message (3) appears.

If **N** is selected in reply to message (3), message (2) reappears; from here on the process repeats itself as explained above.

If **Y** is selected in reply to message (3), message (7) reappears; from here on the process repeats itself [from messages (8) to (11)] as explained above.

After typing the last entry of the line (to be inserted) and **R**, and after typing **N** and **R** [in reply to message (12)], Fig. 10 reappears and the user now reverts to step 11.

Procedure (c3):

Assuming that all corrections have been completed, the user is to type **E** and **R** (step 11); Fig. 9 now reappears, and the user reverts to step 10.

Assuming that at this point all necessary corrections have in fact been completed, the user is to type **N** and **R** (step 10); Fig. 6 now reappears, and the user proceeds to step 13.

Step 13:

Provision of option to continue or to interrupt the procedure

At this point the screen displays Fig. 6.

Now type either **Y** and **R**

or **N** and **R**

as required.

If **Y** is selected, the file completed up to this point is saved, and the program reverts to step 1, with the full range of available (to CMTL) programs reappearing on the screen.

Now the user may either type **EXIT**, or choose another program.

If **N** is selected, step 14 follows.

- **FORM** *TYPEA DATA*

Step 14:

Information identifying the form which will be displayed on the screen in step 15

This form is called TYPE = TYPEA DATA.

At this point the screen displays Fig. 11.

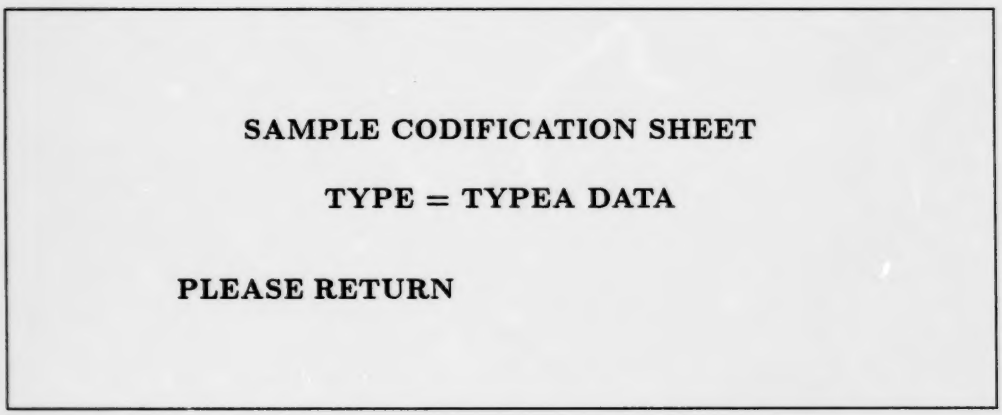

Fig. 11. Screen display for step 14

Now type **R**

Step 15:

Identification of columns in which a repetition of the data is expected

At this point the screen displays Fig. 12.

Now type one **C** [and **R**] at the head of each column in which data repetition is expected. At the head of the others, type **R** only. The program moves the cursor from one column to the next, but skips columns three and four, fourteen and fifteen.

SAMPLE NUMBER	SA ME	DIST FROM	LENGTH OF SEGM	DIP OF	AZ. OF	ZON COD	ROCK COD	STR INF	MIN OUT	% RE	DENS MEAS	DRY BULK	WET BULK	POR OSI

FOR EACH OF THE ABOVE ENTER " C " UNDER LINE
ELSE PRESS " RETURN " FOR NONE CONSTANT VARIABLE

Fig. 12. Screen display for step 15: form *TYPEA DATA*

After typing **R** in the final column (i.e., column 13), step 16 follows.

Step 16:

Data entry

At this point Fig. 12. reappears on the screen, without the **C** entries (typed in step 15).

Now fill in this form called TYPE = TYPEA DATA, as explained in *Appendix 'C'*. This procedure is based on (Sabourin, 1982, pp. 11 to 15).

In order to expedite data entry, the program incorporates a special procedure to allow for the instantaneous entry of repetitive data. This procedure is called *FEM**.

****

The *FEM* procedure:

It should be noted that this procedure is only available, provided a **C** was first entered at the head of the column in question (as mentioned in step 15). In this case, the following messages (a) and (b) will appear each time an entry is completed, and **R** is typed:

Message (a):

IF CONSTANT, ENTER "C" ELSE PRESS RETURN

If **R** is typed, the user proceeds to the next column entry.

If **C** and **R** are typed, message (b) appears, and the user is given the opportunity to instantly enter repetitive data.

Message (b):

THE CONSTANT WILL BE FOR THE DISTANCE OF

COLLAR TO .

In reply to this message (b), the user is to enter those applicable *Distance from Collar* lengths, *from* → *to* which the repetitive data are to apply.

---

* *FEM*: Fast Entry Method

The foregoing (i.e., both single entries and the *FEM* procedure) can be repeated as many times as necessary for the column in question.

****

After completing the last column of form TYPEA DATA, typing of **R** (for the last time) makes Fig. 9 (step 10) reappear. This enables the user to proceed with corrections on form TYPE = TYPEA DATA exactly the same way as has been previously explained (steps 10 to 12) for form TYPE = DAMH.

Step 17:

Provision of option to continue or to interrupt the procedure

The user can proceed exactly as per step 7 (Fig. 6).

If **N** is selected, step 18 follows.

- **FORM** *TYPEB DATA*

Step 18:

Information identifying the form which will be displayed on the screen in step 19

This form is called TYPE = TYPEB DATA

At this point the screen displays Fig. 13.

SAMPLE CODIFICATION SHEET

TYPE = TYPEB DATA

PLEASE RETURN

Fig. 13. Screen display for step 18

Now type **R**

Step 19:

Data entry

Now fill in the form called TYPEB DATA (Fig. 14), as explained in *Appendix 'D'*. This procedure is based on (Sabourin, 1982, pp. 15 and 17).

After completion of the last column of form TYPEB DATA, typing of **R** (for the last time) makes Fig. 9 (step 10) reappear. This enables the user to proceed with corrections on form TYPE = TYPEB DATA exactly the same way as has been previously explained (steps 10 to 12) for form TYPE = DAMH.

Step 20:

Provision of option to continue or to interrupt the procedure

The user can proceed exactly as per step 7 (Fig. 6).

If **N** is selected, step 21 follows.

- **FORM** *TYPE OTHER METALS*

Step 21:

Information identifying the form which will be displayed on the screen in step 22

This form is called TYPE = TYPE OTHER METALS

At this point the screen displays Fig. 15.

Now type **R**. If entry (7) of form *TYPE = TITLE* was left *Blank*, the program advances to step 23. Otherwise step 22 follows.

Step 22:

Data entry

Now fill in the form called *TYPE = OTHER METALS* (Fig. 16), as explained in *Appendix 'E'*. This procedure is based on (Sabourin, 1982, pp. 16 and 17).

DIST. FROM COLLAR	SAMPLE NUMBER	RAD. INS.	TOTAL RADIOACTIVITY	URANIUM			THORIUM		
				ASSAY METHOD	GRADE	RADIO ACTIV	ASSAY METHOD	GRADE	RADIO ACTIV

1) ENTER THE ASSAYING METHOD, -EX: " A "; AND THE GRADE FOR URANIUM, -EX: " 12.345 "

2) AND PRESS " RETURN " FOR EACH OF THEM

Fig. 14. Screen display for step 19: form *TYPEB DATA*

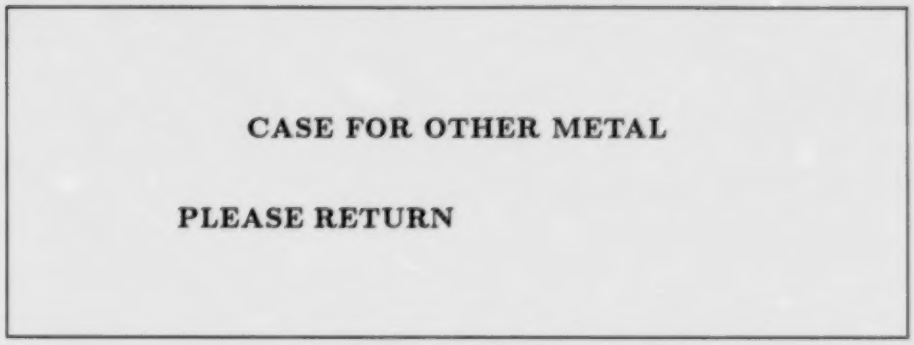

Fig. 15. Screen display for step 21

After completion of the last column of form *TYPE = OTHER METALS*, typing of **R** (for the last time) makes Fig. 9 (step 10) reappear. This enables the user to proceed with corrections on form *TYPE = OTHER METALS* exactly the same way as has been previously explained (steps 10 to 12) for form TYPE = DAMH.

Now type **R**

Step 23:

Provision of option to continue or to interrupt the procedure

Now type either **Y** and **R**

or **N** and **R**

as required.

If **Y** is selected, the file completed up to this point is saved, and the program reverts to step 1, with the full range of available (to CMTL) programs reappearing on the screen.

Now the user may either type **EXIT**, or choose another program.

If **N** is selected, step 24 follows.

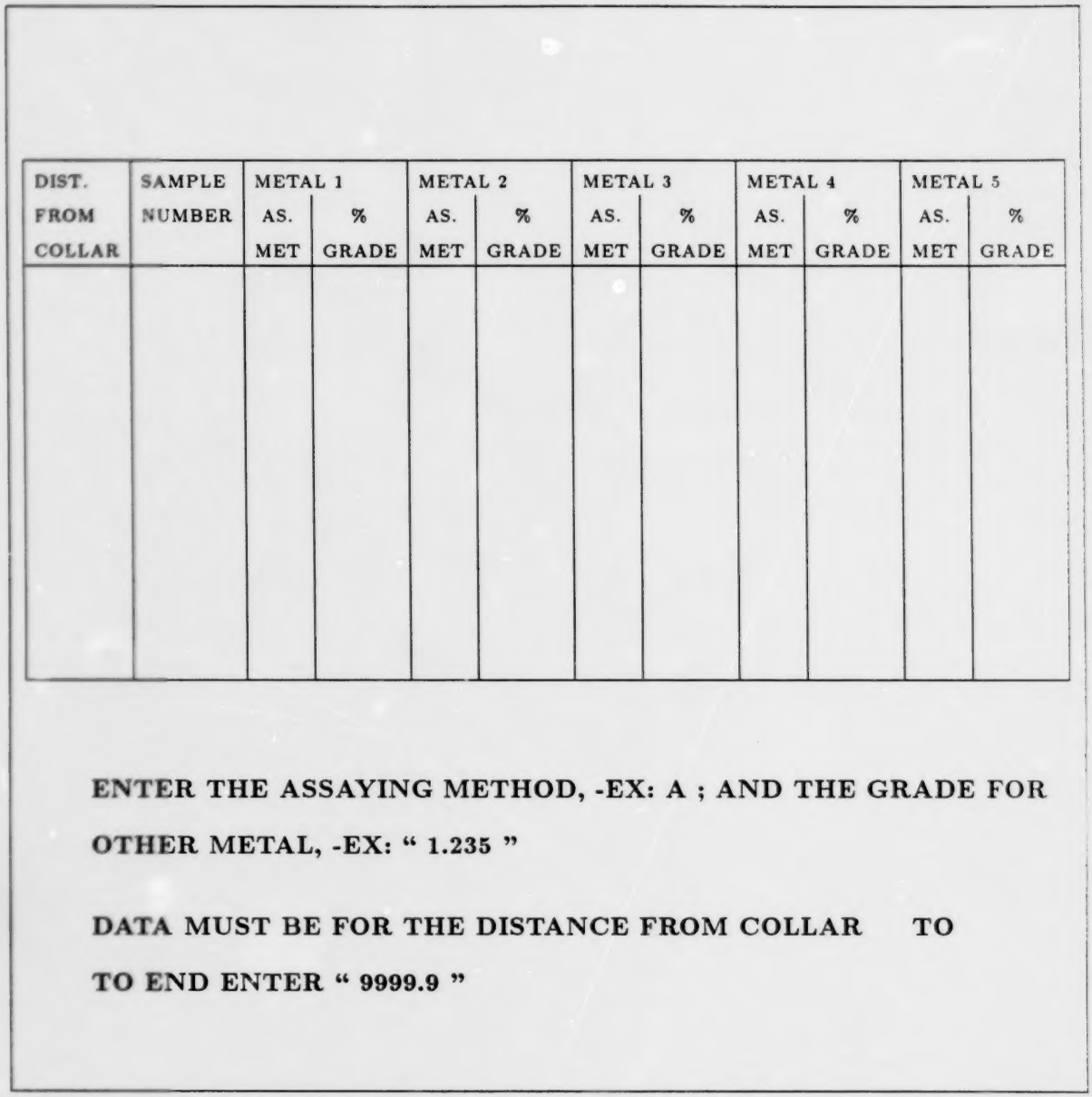

Fig. 16. Screen display for step 22: form *TYPE OTHER METALS*

Step 24:

Provision of opportunity to select the form that requires final corrections

At this point the screen displays Fig. 17.

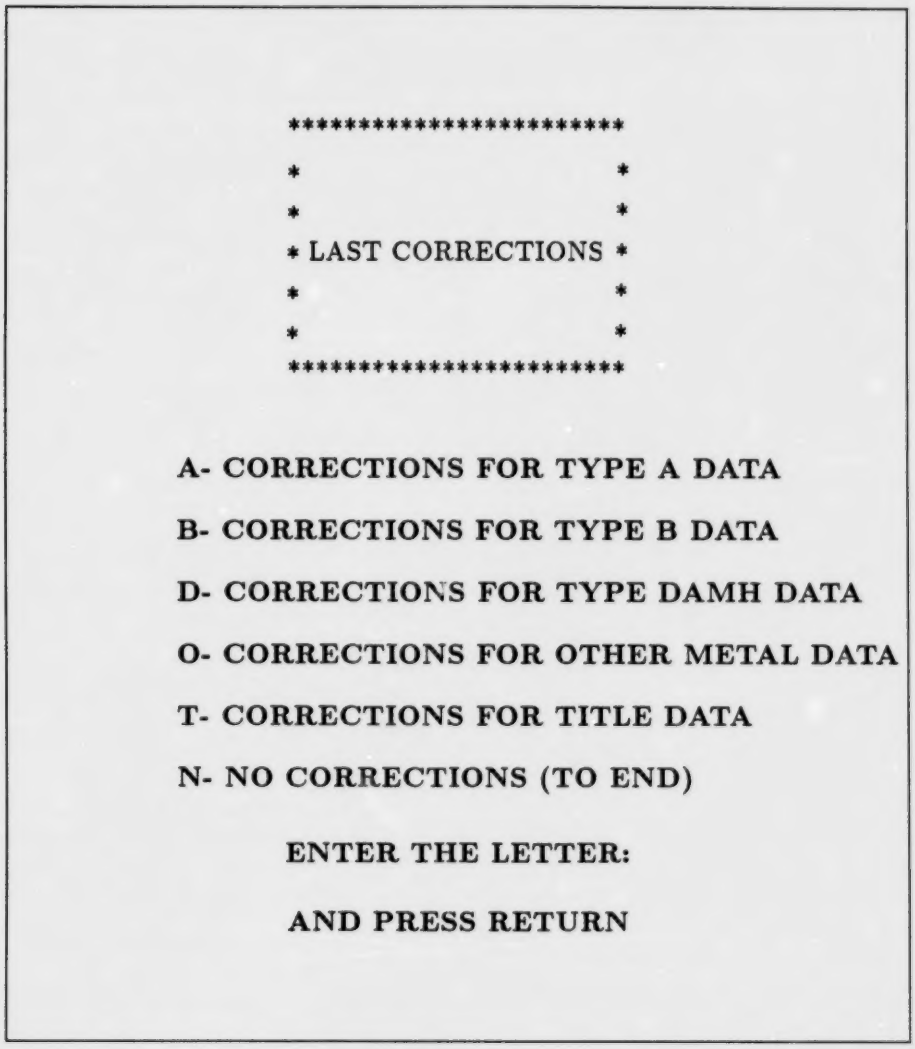
****
LAST CORRECTIONS
A- CORRECTIONS FOR TYPE A DATA
B- CORRECTIONS FOR TYPE B DATA
D- CORRECTIONS FOR TYPE DAMH DATA
O- CORRECTIONS FOR OTHER METAL DATA
T- CORRECTIONS FOR TITLE DATA
N- NO CORRECTIONS (TO END)
ENTER THE LETTER:
AND PRESS RETURN

Fig. 17. Screen display for step 24

Now select the form that requires corrections by typing the corresponding character and **R**, or **N** and **R**.

One form at a time can be selected; corrections are to be made as described in steps 10, 11 and 12. On completing the corrections of any of these forms, Fig. 17 reappears, and another form can be selected.

Finally, type **N** and **R**. The program now *saves* all the data entered on file for the DH in question, and advances to step 25.

Step 25:

Provision of options to: (a) complete a previous DH, or (b) to enter a new DH, or (c) to exit.

At this point the screen displays Fig. 18.

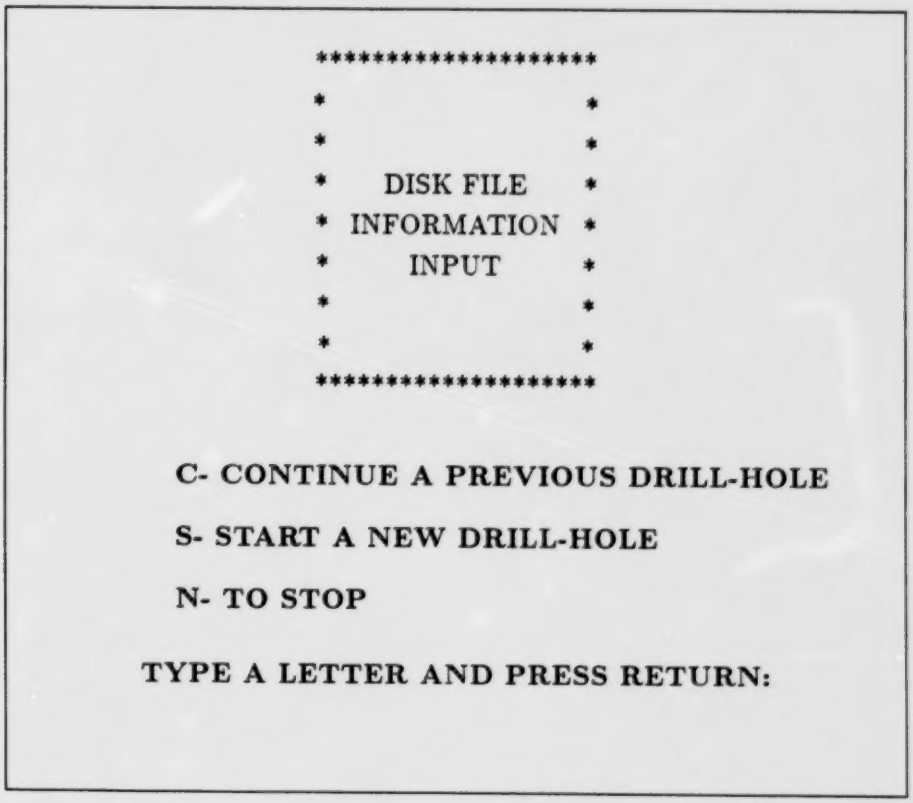

Fig. 18. Screen display for step 25

On typing **C** and **R** an error message instructs the user to type either the **S** and **R**

or the **N** and **R** option.

On typing **S** and **R** the program goes to step 2 and the user can repeat the entire data entry procedure.

On typing **N** and **R** the program goes to step 1. By doing so, the user has completed *entering*, and has *saved*, all data pertaining to one particular drillhole. He can now do the same for any number of drillholes. He is, thereby, building up the drillhole data bank upon which the *CADD* and *GEM* systems are based, as explained earlier in the *Background* section.

EXAMPLE

An appropriate example is given in *Appendix F* to better illustrate the data entry procedure described above in steps 1 to 25.

ACKNOWLEDGEMENT

Mr. R. Sabourin first suggested that a computerized procedure be used for drillhole data entry.

Messrs. A. Coughlan and M. Samson assisted with the computer programing work required to develop the authors' idea of having a rapid and easier , as well as user friendly, interactive, menu driven procedure to achieve the foregoing task.

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APPENDIX 'A'

GUIDE TO COMPLETE

FORM TYPE = TITLE (as per Fig. 5)

GENERAL REMARKS:

— After completion of each *Entry*, type **R**, which will move the cursor to the following *Entry* on this form. However:

(a) should the user enter more than the maximum permissible number of characters in a single entry, the cursor will advance to the position of the last character typed. Now two cases can arise:

(1) the cursor has not reached the last character that can be displayed on a single line of the screen. On typing **R** all excess characters (i.e., in excess of what the program allows for the entry in question) are ignored, and the cursor advances to the beginning of the subsequent entry. Should the remaining (i.e., truncated) entry in question be incorrect, or incomplete, proceed as per point (d) below.

(2) the cursor has reached the last character that can be displayed on a single line of the screen. On typing **R** the cursor reverts to the beginning of the entry in question (i.e., the one with too many characters). The entry can now be reentered.

Note that entries that have been overtyped on the screen during cases (1) and (2) above, are NOT affected on the actual data file, only on the current screen display.

(b) a warning sound will be emitted by the terminal after typing **R**, if a character, which is unacceptable to the program, is typed into a specific entry. In this case the cursor moves to the front of this specific entry, giving the user a chance to retype the entry:

(c) should any type of error be noted by the user BEFORE typing **R**, an appropriate correction can still be effected. This is done by moving the cursor backwards (by pressing the *Backspace Key* to erase all characters up to, and including, the first incorrect one). Now the user may enter the correct information, by retyping all the necessary characters.

(d) should **R** have been typed before noticing the incorrect entry (which is, however, acceptable to the program) see correction procedure given at the end of step 6.

— All entries indicated by a $^{(\ddagger)}$ are optional entries.

— All entries indicated by a $^{(*)}$ are key entries and must be completed. Otherwise the program is not able to produce the data file. In case of key entries which involve the use of codes, the user must be careful to assign the correct code. Otherwise the data

file produced will be incorrect.

— All entries indicated by a (†) are important (but not key) entries. If these entries are not completed, the program will produce an incomplete data file.

Entry (1)(*), MEG (Mine Evaluation Group, now ORAG):

This entry refers to the program user's identification number (IN) for the deposit in question. Three letters, must be entered here.

No error message will appear, even if incorrect IN was used.

Entry (2)(*), DRILLHOLE NUMBER:

This entry refers to the program user's identification of the DH in question. Four numbers must be entered here, ranging from 1 to 9999. This will identify the DH coding sequence decided upon by the user. The same DH number must NOT be assigned to different holes in the same deposit (otherwise an error message appears).

Entry (3)(†), COMPANY DRILLHOLE NUMBER:

This entry is limited to any seven characters. The mining company's drillhole number is used.

Entry (4)(*), NO. OF CONTINUOUS HOLES:

Normally each DH is entered separately. In this case entry (4) is a BLANK.

However, in very special cases, several drillholes (a maximum of three) may be combined to form one drillhole; e.g., in the case of U/G drilling, an upward DH, face or wall samples and a downward DH can be coded as one drillhole, or as separate drillholes, as required. In the latter case, their DH numbers must be consecutive. For example, if AAA0024 is the upward DH number, then AAA0025 must refer to the face or wall samples and AAA0026 to the downward drillhole.

In this case entry (4) of the first drillhole of the combination must show how many drillholes are to be combined. In the above example, entry (4) for drillhole AAA0024 will be **3**; it will be a BLANK for drillholes AAA0025 and AAA0026.

Entry (5)(†), SPECIAL IDENTIFICATION OF DRILLHOLE:

This entry is limited to a maximum of any six characters. Entry (5) is provided for the user's convenience. It represents additional information, where the DH is part

of an overall grid pattern. Entry (5) identifies the DH as well as its location within the overall grid pattern. As an example it is logical to let: (a) the two first letters, followed by two digits, identify the unit square in which the drillhole is located, and (b) the last two digits identify the drillhole within the unit square. Consequently, AB3303 could indicate that the drillhole is located in unit square AB33 and that the DH is assigned the number 03 in that unit square (Fig. 5). In a very dense drilling pattern, entry (5) provides a quick and easy way to locate the drillhole.

Entry (6)(*), UNIT CODE:

Four numbers MUST be typed into this entry, in sequence a), b), c), and d), as explained hereafter. These codes identify the measuring units used to express:
a) the DH location; b) the segment length (i.e. distance from DH collar, including length of DH and casing lengths); c) the grade of uranium, and/or thorium, and/or other metals; d) the core or rock density (not operative).

For a) and b) the codes are:

1) — if imperial units are used

2) — if metric units are used

For c) the codes are:

1) — if pounds (of U_3O_8 *and/or* ThO_2) per short ton of ore are used

2) — if weight % of U_3O_8 *and/or of* ThO_2 is used

3) — if weight % of U, and/or of Th, and/or of other metals is used

For (d) the code is always a **0** because in this case the present program does not identify the measuring units used.

Entry (7)(*), CODES FOR OTHER METALS:

Metals other than U_3O_8 and ThO_2 can be entered here. This entry is limited to a maximum of a ten digit number, using two numbers per metal (up to a maximum of five metals). Some, or all of these entries can be BLANKS. At present the codes for entry (7) are as follows (however, other numbers can be added, if required):

Codes for other metals	Codes
nickel (%)	05
molybdenum (%)	07
gold (in troy oz/short ton)	09
gold (in grams/tonne)	11
silver (in troy oz/short ton)	13
silver (in grams/tonne)	15
platinum (in troy oz/short ton)	17
platinum (in grams/tonne)	19
copper (%)	21
CO_3 (%)	23
lead (%)	25
arsenic (%)	27
cobalt (%)	29
sulphur (%)	31
iron (%)	33
yttrium (%)	35

Entry (8)(†), NO. OF DIP AND AZIMUTH MEASUREMENTS:

This entry must be a number, ranging from **2** to **96**. (see special note under step 9).

Entry (9)(‡), TYPE OF INSTRUMENT:

This entry is limited to one number. This number specifies the type of survey instrument used. The following code applies:

Codes for deviation survey type of instrument	
acid test	1
transit survey (short holes, at collar only)	2
magnetic drillhole survey (e.g. tropari)	
single-shot	3
multi-shots	4
gyroscopic drillhole survey	
single-shot	5
multi-shots	6
photographic drillhole survey (e.g. ABEM reflex-fotobor)	7

Entry (10)(*), LENGTH OF DRILLHOLE:

This entry is limited to a maximum of a six digit number, plus the decimal point (which must always be included).

This entry refers to the total length of the DH.

The overall DH length must be in the same unit code as is used in entry (6) to record the segment length.

Note:

the overall length entered here must be equal to, or exceed, any of the *Distance from Collar* lengths that will be given in the third column of form TYPEA DATA (see Fig. 12). Otherwise it is impossible to complete form TYPEA DATA (see relevant instructions in *Appendix 'C', third column).* It is, therefore, strongly recommended, that entry (10) exceeds the expected value. The program will automatically calculate the correct figure, after completion of form TYPEA DATA (see Fig. 12), and enter this value.

Entry (11)(‡), DIP OF MINERALIZED ZONE(S):

Entry (11) is the dip of the mineralized zone(s) in the vicinity of the DH. The dip of a mineralized zone has a positive sign downward from the horizontal plane (see Fig. A-1). This entry is limited to a maximum of a two digit number.

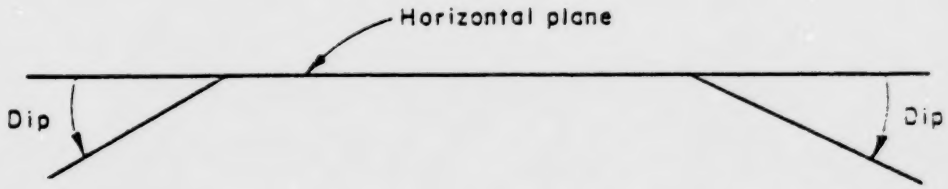


Fig. A-1. Dip of mineralized zone(s) (entry 11)

Entry (12)(‡), THE AZIMUTH OF THE DIP OF THE MINERALIZED ZONE(S):

Entry (12) is measured clockwise from the North of a coordinate system. It is the azimuth of the dip of the mineralized zone(s) in the vicinity of the DH (Fig. A-2.).

This entry is limited to a maximum of a three digit number.

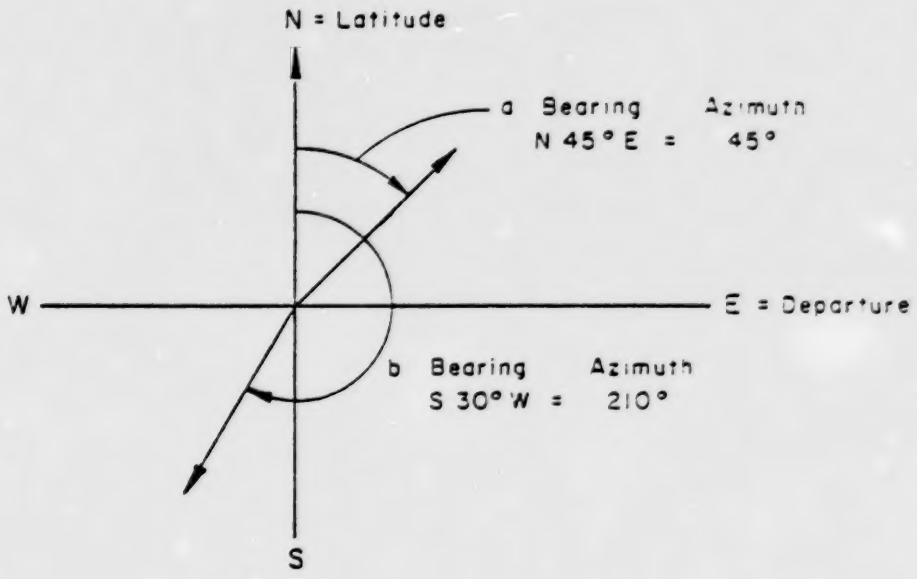


Fig. A-2. Azimuth of the dip of the mineralized zone(s) (entry 12)

Entry (13)(‡), DATE DH DRILLING STARTED:

This entry must be a six digit number.

The first group of two represents the year;

the second group of two represents the month, and;

the third group of two represents the day.

Entry (14)(‡), DATE DH DRILLING COMPLETED:

This entry must be a six digit number.

The first group of two represents the year;

the second group of two represents the month, and;

the third group of two represents the day.

Entry (15)(†), DEPARTURE OF THE DH COLLAR:

This entry is limited to a maximum of a six digit number plus the decimal point, which must always be included. This entry must be completed. It is the *EASTING* of the collar of the DH in a mine co-ordinate system or in the Universal Transverse Mercator System (UTM).

Entry (16)(†), LATITUDE OF THE DH COLLAR:

This entry is limited to a maximum of a six digit number plus the decimal point, which must always be included. This entry must be completed. It is the *NORTHING* of the collar of the DH in a mine co-ordinate system or in the Universal Transverse Mercator System (UTM).

Entry (17)(†), ELEVATION OF THE DH COLLAR:

This entry is limited to a maximum of a six digit number plus the decimal point, which must always be included. This entry must be completed. It is the elevation of the DH collar.

Entry (18)(‡), DH CORE DIAMETER SYMBOL:

This entry is limited to three letters. The usual industry symbols, such as XRT, BW, NQ, etc., are used. This entry is optional.

Entry (19)(‡), DH DIAMETER:

This entry is limited to a maximum of a three digit number. It is an optional entry used to describe the diameter of a DH produced by means other than by diamond drilling. This size must be entered in the same unit code as is used to record the segment length in entry (6).

Entry (20)(‡), CODE SYMBOL OF THE INITIAL CASING AT COLLAR:

This entry is limited to three letters. The usual industry symbols, such as BW, BX, etc., are used. This entry is optional. Entry (20) gives the code of the initial casing (i.e., the one the DH was started with at the collar).

Entry (21)(‡), CODE SYMBOL OF THE SINGLE OR OF THE FINAL CASING:

This entry is limited to three letters. The usual industry symbols, such as BW, BX, etc., are used. This entry is optional. Entry (21) gives the code of either the single

casing used, or of the final one, if more than one is used.

Entry (22),(‡), LENGTH OF THE INITIAL CASING AT COLLAR:

This entry is limited to a maximum of a four digit number, plus the decimal point, which must always be included. The same unit code is used as in entry (6) to record the segment length. Entry (22) gives the length of the initial casing (i.e., the one at the collar). This entry is optional.

Entry (23)(‡), LENGTH OF THE SINGLE OR OF THE FINAL CASING:

This entry is limited to a maximum of a three digit number, plus the decimal point, which must always be included. The same unit code is used as in entry (6) to record the segment length. Entry (23) gives the length of either the single casing used, or of the final one, if more than one is used. This entry is optional.

Entry (24)(‡), GENERAL INFORMATION:

This entry is optional. It is limited to any 64 characters, and is provided for the user's convenience.

FINAL REMARK:

After completion of entry (24), the user may either proceed with error corrections (see instructions at the end of step 6) or proceed to step 7 (Fig. 6).

APPENDIX 'B'

GUIDE TO COMPLETE

FORM TYPE = DAMH (as per Fig. 8)

GENERAL REMARKS:

— This form is completed by columns (and not rowwise, as form TYPE = TITLE).

— An appropriate message at the bottom of the screen instructs the user as to which column is to be completed next. This message remains unchanged until the column in question is completed. On typing **R** after completion of the final entry, a new message appears. As an example in case of the *Second Column* the appropriate message is

ENTER THE DISTANCE FROM COLLAR TO MEASUREMENTS; EX: 123456.7

— After completion of each *Entry*, type **R**, which will move the cursor to the following *Entry* in the column currently being completed.

— A maximum of 96 entries can be typed into each column; every column must contain the same number of entries. The cursor will automatically move from one column to the next, as the number of entries in each column equals the number previously typed into entry (8) of form TYPE =TITLE (Fig. 5). In case of the second column only, see additional information.

— the screen displays only 14 lines of entry at any one time. On completion of these, another 14 blank lines of entry will appear (up to a maximum of 96). However:

(a) should the user enter more than the maximum permissible number of characters in a single entry, the cursor will advance to the position of the last character typed. Now two cases can arise:

(1) the cursor has not reached the last character that can be displayed on a single line of the screen. On typing **R** all excess (i.e., in excess of what the program allows for the entry in question) characters are deleted and the cursor advances to the beginning of the subsequent entry. Should the remaining (i.e., truncated) entry in question be incorrect, or incomplete, proceed as per point (d) below.

(2) the cursor has reached the last character that can be displayed on a single line of the screen. On typing **R** the cursor reverts to the beginning of the entry in question (i.e., the one with too many characters). The entry can now be reentered.

Note that entries that have been overtyped on the screen during cases (1) and

(2) above, are NOT affected on the actual data file, only on the screen display.

(b) a warning sound will be emitted by the terminal after typing **R**, if a character, which is unacceptable to the program, is typed into a specific entry. In this case the cursor moves to the front of this specific entry, giving the user a chance to retype the entry;

(c) should an error be noted BEFORE typing **R**, then an appropriate correction can still be effected. This is done by moving the cursor backwards (by pressing the *Backspace Key* to erase all characters up to and including, the first incorrect one). Now the user may enter the correct information, by retyping al the necessary characters.

(d) should **R** have been typed before noticing the incorrect entry, see correction procedure given in steps 10 to 12.

— All entries indicated by a (‡) are optional entries.

— All entries indicated by a (*) are key entries and must be completed. Otherwise the program is not able to produce the data file. In case of key entries which involve the use of codes, the user must be careful to assign the correct code. Otherwise the data file produced will be incorrect.

— All entries indicated by a (†) are important (but not key) entries. If these entries are not completed, the program will produce an incomplete data file.

First Column, LINE NUMBER:

This column is completed automatically by the program, as column 2 is being filled.

Second Column(*), DISTANCE FROM COLLAR TO MEASUREMENTS¶:

This column contains the distances from the collar of the DH, as originally reported in the survey record. The same unit code is used as in entry (6) on form TYPE = TITLE to record the segment length. Entries in this column are limited to a maximum of a seven digit number, plus the decimal point (which must always be included as per example displayed on the screen).

Should the user enter a number greater than the one previously typed into entry (10) of form *TITLE* (Fig. 5), a warning sound will be emitted by the terminal (after typing **R**) and an error message flashed instructing the user to overtype the incorrect entry.

¶ the measurements, which are listed in columns 3 and 4

Third Column(*), DIP MEASUREMENT OF DH:

Entries in this column are limited to a maximum of a three digit number (plus the decimal point), ranging from **0.** to plus or minus **90.** (with or without a negative sign) as per example displayed on the screen (i.e., these entries signify *degrees*).

The cursor will move to column 4 automatically, as mentioned above under GE - NERAL REMARKS.

Fourth Column(*), AZIMUTH MEASUREMENT OF DH:

Entries in this column are limited to a maximum of a three digit number (plus the decimal point), ranging from **0.** to **360.** as per example displayed on the screen (i.e., these entries signify *degrees*).

The cursor will move to column 5 automatically, as mentioned above under GE - NERAL REMARKS.

Fifth Column(‡), COMMENTS:

Entries in this column are limited to any 36 characters. Entries are optional, at user's convenience. Should no comments be necessary, the column is completed by entering **R** as many time as in the previous columns. After entering **R** for the last time, step 10 of the overall program follows, with the screen display as shown in Fig. 9.

FINAL REMARK:

After completion of the last entry of column 5 (Fig. 8) the user may either proceed with error corrections (see instructions at the end of step 6) or proceed as per step 7 (Fig. 6) except that on typing **N** and **R** step 17 follows.

APPENDIX 'C'

GUIDE TO COMPLETE

FORM TYPE = TYPEA DATA (as per Fig. 12)

GENERAL REMARKS:

— This form is completed by columns (and not rowwise, as form TYPE = TITLE).

— An appropriate message at the bottom of the screen instructs the user as to which column is to be completed next. This message remains unchanged until the column in question is completed. On typing **R** after completion of the final entry, a new message appears. As an example in case of the *Fifth Column* the appropriate message is

ENTER THE DIP OF SEGMENT EX:"123"

— After completion of each *Entry*, type **R**, which will move the cursor to the following *Entry* in the column currently being completed, unless a **C** was placed at the top of this column in step 15 (note that **C** could not be placed on top of columns 3, 4, 14 and 15). Should a **C** have been typed in step 15, the program gives the user an opportunity to specify from what *Distance from Collar* lengths the repetition of the entry (preceding the last **R**) applies. This is done as explained in step 16 for fast entry *FEM*. The special additional information for column 1 should also be noted.

— A maximum of 600 entries can be typed into each column. The cursor will automa - tically move from one column to the next, as the number of entries in each column equals the number of entries contained in column 3. The entries in every column must be based upon the corresponding *Distance from Collar* entries in column 3. All columns can only contain as many entries as column 3.

— The screen displays only 14 lines of entry at any one time. On completion of these, another 14 blank lines of entry will appear (up to a maximum of 600). However:

(a) should the user enter more than the maximum permissible number of characters in a single entry, the cursor will advance to the position of the last character typed. Now two cases can arise:

(1) the cursor has not reached the last character that can be displayed on a single line of the screen. On typing **R** all excess (i.e., in excess of what the program allows for the entry in question) characters are ignored and the cursor advances to the beginning of the subsequent entry. Should the remaining (i.e., truncated) entry in question be incorrect, or incomplete, proceed as per point (d) below.

(2) the cursor has reached the last character that can be displayed on a single line of the screen. On typing **R** the cursor reverts to the beginning of the entry in question (i.e., the one with too many characters). The entry can now be

reentered.

Note that entries that have been overtyped on the screen during cases (1) and (2) above, are NOT affected on the actual data file, only on the screen display.

(b) a warning sound will be emitted by the terminal after typing **R**, if a character, which is unacceptable to the program, is typed into a specific entry. In this case the cursor moves to the front of this specific entry, giving the user a chance to retype the entry;

(c) should an error be noted BEFORE typing **R**, then an appropriate correction can still be effected. This is done by moving the cursor backwards (by pressing the *Backspace Key* to erase all characters up to and including, the first incorrect one). Now the user may enter the correct information, by retyping al the necessary characters;

(d) should **R** have been typed before noticing the incorrect entry, see correction procedure given in steps 10 to 12.

— All entries indicated by a (‡) are optional entries.

— All entries indicated by a (*) are key entries and must be completed. Otherwise the program is not able to produce the data file. In case of key entries which involve the use of codes, the user must be careful to assign the correct code. Otherwise the data file produced will be incorrect.

— All entries indicated by a (†) are important (but not key) entries. If these entries are not completed, the program will produce an incomplete data file.

Third Column(*), DISTANCE FROM COLLAR:

The program places the cursor into this column first.

This column contains the distances from the collar of the DH, as originally recorded in the survey report. The same unit code is used as in entry (6) on form TYPE = TITLE to record the segment length. Entries in this column are limited to a maximum of a seven digit number, plus the decimal point (which must always be included as per example displayed on the screen). These numbers are always positive values.

As column 3 is being completed, the program automatically completes column 4 (by taking the difference between two consecutive entries in column 3 (which amounts to the *Length of the Segment*).

As mentioned earlier (see *Appendix 'A'*, entry (10), Note) any number entered in

column 3, must be equal to, or be less than, the one in entry (10) of form *TITLE* (see Fig. 5). Should an incorrect entry be typed, a warning sound will be emitted by the terminal (after typing **R**), and an error message flashed instructing the user to overtype the incorrect entry.

After the last entry, type (**9999.9** and **R**) into column 3. Now the cursor moves to the end of column 4.

Note:

should the user notice a mistaken entry in column 3, a correction procedure can be effected as follows:

type **9999.9** and **R**. Now message (a) appears:

Message (a):

GIVE ME THE LENGTH OF THE LAST SEGMENT

The user must now again type **9999.9** and **R**. Now the message (b) appears:

Message (b):

SELECT CODED DISTANCE FROM COLLAR TO CONTINUE

The user must now enter the *Distance From Collar* value where an error has to be corrected, and type **R**. The cursor reverts to the indicated erroneous entry; the user must now retype the entries in column 3 from here onward; the original entries which are thereby being overtyped, are ignored. This procedure can be repeated as often as is necessary.

Fourth Column, LENGTH OF SEGMENT:

As mentioned above, column 4 is filled in automatically, except for the last entry. The cursor moves here, when the final **9999.9** and **R** are typed in column 3. Now type in column 4 the length of the last segment and **R**. The cursor now moves to column 11.

Eleventh Column(†), PERCENT RECOVERY:

This is the ratio (×100) between the length of core recovered and the corresponding length of the segment drilled. This entry is limited to a maximum of a two digit number. However, should the recovery be 100%, type **-1**.

After typing the last **R**, the cursor moves to column 2.

Second Column(†), SAMPLING METHOD:

This entry is limited to one character, which defines the relevant sampling code. This code is as follows:

Sampling methods	Codes
Missing sampled segment	0
Chip sample	1
Channel sample	2
Underground DH	3
Surface DH	4
Percussion drillhole	5
Blast hole	6
Scanner sample	7
Unknown sampling method	8
Dummy segment inserted by ORAG	U

On typing **R**, after the last entry, the cursor moves to column 1.

First Column(†), SAMPLE NUMBER:

This entry is limited to any eight characters. Normally a company number is used here, identifying the relevant chemical assay. The first entry (normally right or left justified, at user's convenience) is completed by entering all eight characters individually (including the *blanks*) and by typing **R** after each of them. After the eighth **R**, the program gives the user the opportunity of:

(a) either a fast entry procedure (see details below, for this special procedure) in case of repetitive characters, provided **C** has been typed at the head of column 1 in step 15.

(b) if **C** was not entered in step 15, complete each line of entry as explained above.

In case of point (a) above the bottom of the screen displays the *FEM* (i.e., *Fast Entry Message*):

IF CONSTANT, ENTER " C " ELSE PRESS RETURN

Should **R** be entered, the cursor moves to the next entry in column 1. Should **C** be entered, the following message appears:

THE CONSTANT WILL BE FOR THE DISTANCE OF COLLAR TO .

The user now has to enter those *Distance from Collar* values (in line with the appropriate ones previously entered in column 3) *from* where *to* where the characters in the just completed line of entry will repeat themselves. For a correct entry, each character must be considered individually.

On typing **R** after entering both of these distances, the screen will display the line of entry just completed (prior to the foregoing message) plus an additional line of column 1. An example is shown in Fig. C-1, with **C** already entered where necessary (for the particular example in question).

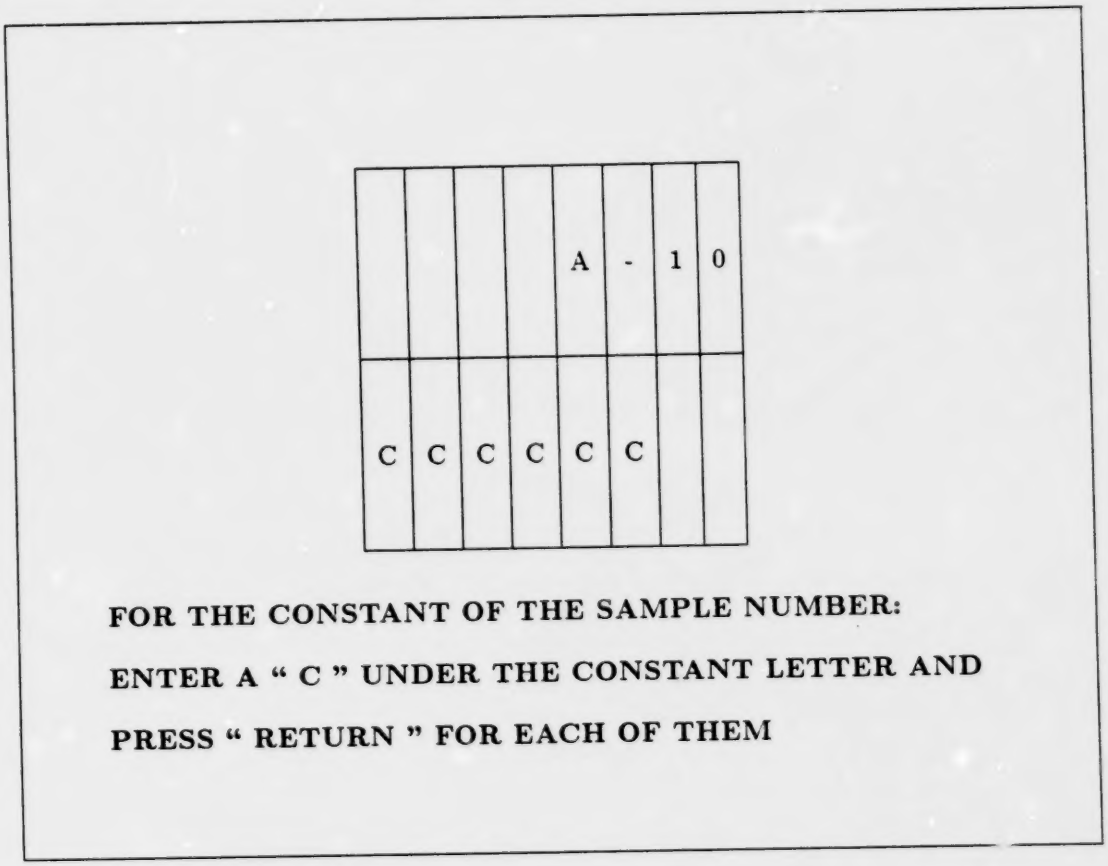


Fig. C-1. Screen display to permit fast repetitive entries in column 1

Note that **C** was entered below every character which will be repetitive for the *from* → *to* range in question. After typing **R** at the end of the second line of Fig. C-1, Fig. 12 reappears on the screen with the *FEM* and with all of the previously completed

lines of entry; the cursor now moves to the first incomplete line. Wherever *Blanks* were left in line 2 of Fig. C-1, the user must now enter the necessary data. This process continues to the end of the specified distance range.

At this stage the process becomes identical to the situation encountered at the very top line of column 1.

After typing **R** at the end of the very last line of column 1, the cursor moves to column 8.

Eighth Column(†), ROCK CODE:

This column consists of three sub-columns, each containing any two characters. The entire column serves to provide a code for geological information that may be useful for further activities. The code is at user's convenience. However, within ORAG, the first two characters refer to the *Rock Type*; the second two refer to *Mineral Type*; and the last two refer to *Other Geological Features*. This is done in order to link this data file with the CADD/GEM system (mentioned in this report's *INTRODUCTION*).

Each of the three sub-column are completed independently as if they were separate columns of their own. For each sub-column the procedure of entry is the normal one, as described in this *Appendix*, and in step 16.

On typing **R** after the last entry of the third sub-column, the cursor moves to column 5.

Fifth Column(†), DIP OF SEGMENT:

This entry is limited to a maximum of a three digit number, ranging from **0** to plus or minus **90** (with or without a negative sign). It specifies the dip of the DH in degrees at the beginning of a segment (i.e., at the *Distance from Collar* points previously entered). It is negative downward, and positive upward. If form TYPE = DAMH (Fig. 8) was used, this column is skipped by the cursor.

On typing **R** after the last entry, the cursor moves to column 6.

Sixth Column(†), AZIMUTH OF SEGMENT:

This entry is limited to a maximum of a three digit number, ranging from **0** to **360**. It specifies the azimuth of the dip at the beginning of a segment in degrees (i.e., at the *Distance from Collar* points previously entered). The angle is measured clockwise from the North of the co-ordinate system.

If form TYPE = DAMH (Fig. 8) was used, this column is skipped by the cursor.

Where an entry **90** or **-90** appears in column 5, the corresponding entry in column 6 is automatically filled with **000**, with the cursor instantly moving to the next entry where a non **90** (or a non **-90**) entry appears in column 5.

On typing **R** after the last entry of column 6, the cursor moves to column 7.

Seventh Column(†), ZONE CODE:

This entry is limited to a maximum of any three characters. It identifies either a stratigraphic geological unit, or a typical mineralized zone within a deposit. The same zone code cannot alternate with other zone codes, i.e., the segments within a typical mineralized zone must be adjacent to each other. Should the same zone be repeated elsewhere due to a displacement caused by a thrust fault, a new code must be used for it on repetition.

The *Zone Code* is at user's convenience. However, the columnar position of each character in a specific code is of significance, i.e., code [**Blank, Blank, A**] is different from code [**A, Blank, Blank**].

On typing **R** after the last entry in column 7, the message

IF YOU HAVE NO DATA, ENTER "A"
ELSE PRESS RETURN

appears at the bottom of Fig. 12. If

(a) the user has no data to enter into column 9, he should type **A** and **R**; the cursor will then skip to column 10 and the above message reappears;

(b) the user wishes to fill column 9, he should type **R** and the cursor moves to column 9 (with the standard message at the bottom of the screen).

Ninth Column(‡), STRUCTURAL INFORMATION:

This column consists of three sub-columns, each containing one number. The entire column serves to provide a code for structural information that may be useful for further activities. The code chosen by ORAG incorporates three variables to identify the structural features of the host rock of a core sample. Each of the three sub-columns are completed independently, as if they were separate columns of their own. For each sub-column the procedure of entry is the normal one, as described in this *Appendix* and in step 16.

The code being entered is as follows:

First sub-column:

This code specifies the *Angle of the Dominant Discontinuity.* It ranges from **1** to **9**. It refers to the maximum angle (always positive) between a horizontal plane and the plane of discontinuity, measured in tens of degrees. Therefore, from 1 to 10 deg. the code is **1**, and from 80 to 90 deg. the code is **9**. For 0 the code is **0**.

Second sub-column:

This code specifies the *Type of Discontinuity.* It ranges from **0** to **4**, as follows:

0 — if the material (fracture filling etc.) is absent in the dominant discontinuity;

1 — if the material is present in the dominant discontinuity;

2 — if slickensiding is observed on the plane of the dominant discontinuity;

3 — if the core is mainly schistose, i.e., the repetitive discontinuities are less than 2 mm;

4 — if the core shows shaly or slaty cleavage, with the repetitive discontinuities being from 2mm to 2 cm apart.

Third sub-column:

This code specifies the *number of Natural Discontinuities.* If their number exceeds eight, the code is **9**. Otherwise their actual number is used as the code.

On typing **R** after the last entry of the third sub-column, the message

IF YOU HAVE NO DATA, ENTER "A"
ELSE PRESS RETURN

appears at the bottom of Fig. 12. If

(a) the user has no data to enter into column 10, he should type **A** and **R**: the screen now displays Fig. C-2;

(b) the user wishes to fill column 10, he should type **R**; the cursor moves to column 10.

Tenth Column(†), MINED-OUT CODE:

This column is limited to one character, which can be either, **M** or a *BLANK.*

It is used in very special cases, where several drillholes are combined with face or wall samples to form one drillhole [as mentioned in *Appendix 'A'*, entry (4)]. If the corresponding entry in column 3 refers to a face or a wall sample, enter M in column 10. Otherwise leave a *BLANK*.

On typing **R** after the last entry of column 10, the screen displays Fig. C-2.

It provides the user with an opportunity to skip columns 12, 13, 14 and 15.

FOR THE NEXT QUESTIONS ANSWER " Y " OR " N "

DENSITY MEASURE METHOD ?

DRY BULK DENSITY ?

WET BULK DENSITY ?

POROSITY ?

Fig. C-2. Screen display for preliminaries to columns 12, 13, 14 and 15

Now type either **Y** and **R**

or **N** and **R**

as required, for each of the four questions shown one at the time on the screen (which correspond to columns 12, 13, 14 and 15 of Fig. 12, respectively). Wherever **N** and **R** is typed, the cursor skips the corresponding column(s). Otherwise, the user will be able to complete the respective column(s), except for the last two questions (i.e., columns 14 and 15). These are skipped automatically, if **N** was entered in reply to the first two questions (i.e., for columns 12 and 13).

On typing **R** after the fourth question

(a) Fig. 12 reappears, provided at least one question was answered with a **Y** and **R**;

(b) otherwise Fig. 9 reappears and the user is given the opportunity to correct form TYPEA DATA, in line with the corresponding steps given previously for form DAMH in steps 10, 11 and 12.

Twelfth Column(†), DENSITY MEASUREMENT METHOD:

This column is limited to a maximum of any two characters. To date ORAG is using the following code:

Code for Density Measurement Methods	Codes
displacement of a liquid	1
loss in weight by immersion in water	2
picnometer or heavy liquid plus westphal balance (fine grain)	3
geophysical instrument	4

On typing R after the last entry, the cursor moves to column 13 (unless N was entered in Fig. C-2 in answer to the respective question).

Thirteenth Column(†), DRY BULK DENSITY:

This column is limited to a maximum of a three digit number plus the decimal point, which must always be included. The unit code must be in line with the one used in entry (6.d) of *Appendix 'A'* for core or rock density. Dry bulk density is the density of the rock or the core, unaffected by moisture.

On typing R after the last entry the cursor moves to column 14 (unless N was entered in Fig. C-2 in answer to the respective question).

Fourteenth Column, WET BULK DENSITY:

This column is limited to a maximum of a three digit number plus the decimal point, which must always be included. The unit code must be in line with the one used in entry (6.d) of *Appendix 'A'* for core or rock density. Wet bulk density is the density of the rock or the core, with moisture.

On typing R after the last entry the cursor moves to column 15 (unless N was entered in Fig. C-2 in answer to the respective question).

Fifteenth Column, POROSITY:

This column is limited to a maximum of a two digit number plus the decimal point, which must always be included. The porosity is the percentage of pore spaces in the sample.

On typing **R** after the last entry, Fig. 9 reappears and the user is given the opportunity to correct form TYPEA DATA in line with the corresponding procedure given previously for form DAMH in steps 10, 11 and 12.

FINAL REMARK:

After completion of the last entry in the final operative column of Fig. 12, the user may either proceed with error corrections (see instructions at the end of step 6) or proceed as per step 7 (Fig. 6) except that on typing **N** and **R** step 18 follows.

APPENDIX 'D'

GUIDE TO COMPLETE

FORM TYPE = TYPEB DATA (as per Fig. 14)

GENERAL REMARKS:

— This form is completed by columns (and not rowwise, as form TYPE = TITLE).

— An appropriate message at the bottom of the screen instructs the user as to which column is to be completed next. This message remains unchanged until the column in question is completed. On typing **R** after completion of the final entry, and after answering to the next Y or N question, for the next column, a new message appears. As an example in case of the *Fourth Column* the appropriate message is

ENTER THE TOTAL RADIOACTIVITY, EX:"1234"

and in case of columns 5 and 6, the message is as shown in Fig. 14.

— After completion of each *Entry*, type **R**, which will move the cursor to the following *Entry* in the column currently being completed. The *FEM* procedure (see step 16) applies only to those columns, for which the relevant messages (a) and (b) appear.

— A maximum of 600 entries can be typed into each column. The cursor will automa - tically move from one column to the next, as the number of entries in each column equals the number of entries contained in column 1. The entries in every column must be based upon the corresponding *Distance from Collar* entries in column 3 in form TYPEA DATA (Fig. 12). All columns can only contain as many entries as this column 3.

— The screen displays only 14 lines of entry at any one time. On completion of these, another 14 blank lines of entry will appear (up to a maximum of 600). However:

(a) should the user enter more than the maximum permissible number of characters in a single entry, the cursor will advance to the position of the last character typed. Now two cases can arise:

(1) the cursor has not reached the last character that can be displayed on a single line of the screen. On typing **R** all excess (i.e., in excess of what the program allows for the entry in question) characters are ignored and the cursor advances to the beginning of the subsequent entry. Should the remaining (i.e., truncated) entry in question be incorrect, or incomplete, proceed as per point (d) below.

(2) the cursor has reached the last character that can be displayed on a single line of the screen. On typing **R** the cursor reverts to the beginning of the entry in question (i.e., the one with too many characters). The entry can now be

reentered.

Note that entries that have been overtyped on the screen during cases (1) and (2) above, are NOT affected on the actual data file, only on the screen display.

(b) a warning sound will be emitted by the terminal after typing **R**, if a character, which is unacceptable to the program, is typed into a specific entry. In this case the cursor moves to the front of this specific entry, giving the user a chance to retype the entry;

(c) should an error be noted BEFORE typing **R**, then an appropriate correction can still be effected. This is done by moving the cursor backwards (by pressing the *Backspace Key* to erase all characters up to and including, the first incorrect one). Now the user may enter the correct information, by retyping al the necessary characters;

(d) should **R** have been typed before noticing the incorrect entry, see correction procedure given in steps 10 to 12

— All entries indicated by a (‡) are optional entries.

— All entries indicated by a (•) are key entries and must be completed. Otherwise the program is not able to produce the data file. In case of key entries which involve the use of codes, the user must be careful to assign the correct code. Otherwise the data file produced will be incorrect.

— All entries indicated by a (†) are important (but not key) entries. If these entries are not completed, the program will produce an incomplete data file.

After typing **R** in step 18 a series of messages will appear on the screen. They are provided so as to speed up data entry by skipping columns for which no data are available. For column 3 the message is:

DO YOU HAVE DATA FOR RADIO. INSTRUMENT?

ANSWER " Y " OR " N "

On typing **Y** and **R**, form TYPEB DATA (Fig. 13) appears and the column can be completed. After completion of the column, the message for column 4 appears.

On typing **N** and **R** the message for column 4 is displayed on the screen, which is:

DO YOU HAVE DATA FOR TOTAL RADIOACTIVITY?

ANSWER " Y " OR " N "

On typing **Y** and **R**, form TYPEB DATA (Fig. 13) appears and the column can be completed. After completion of the column, the message for columns 5 and 6 appears.

On typing **N** and **R** the message for columns 5 and 6 is displayed on the screen, which is:

DO YOU HAVE DATA FOR THE ASSAY. METHOD AND

GRADE FOR THE URANIUM?

ANSWER " Y " OR " N "

On typing **Y** and **R**, form TYPEB DATA (Fig. 13) appears and the columns can be completed. After completion of these columns, the message for column 7 appears.

On typing **N** and **R** the message for column 7 is displayed on the screen, which is:

DO YOU HAVE DATA FOR THE RADIO-ACTIVITY FOR THE URANIUM ?

ANSWER " Y " OR " N "

On typing **Y** and **R**, form TYPEB DATA (Fig. 13) appears and the column can be completed. After completion of the column, the message for columns 8 and 9 appears.

On typing **N** and **R** the message for columns 8 and 9 is displayed on the screen, which is:

DO YOU HAVE DATA FOR THE THORIUM ?

ANSWER " Y " OR " N "

On typing **Y** and **R**, form TYPEB DATA (Fig. 13) appears and the columns can be completed. After completion of these columns, the message for column 10 appears.

On typing **N** and **R** the message for column 10 is displayed on the screen, which is:

DO YOU HAVE DATA FOR THE RADIO-ACTIVITY FOR THE THORIUM ?

ANSWER " Y " OR " N "

On typing **N** and **R**, the user may either proceed with error corrections (see instructions at the end of step 6) or proceed as per step 7 (Fig. 6) except that on typing **N** and **R** step 19 follows.

First Column, DISTANCE FROM COLLAR:

This column is completed automatically, with the program entering the same data as were previously typed into column 3 of form TYPEA DATA (Fig. 12).

Second Column(†), SAMPLE NUMBER:

This column is completed automatically, with the program entering the same data as were previously typed into column 1 of form TYPEA DATA (Fig. 12).

Third Column(†), RADIOMETRIC INSTRUMENT:

Entries in this column are limited to three characters. This entry is a code identifying the instrument used in determining the radioactivity of the segment along the DH. The code has been developed by ORAG. The first two letters identify the radiometric instrument used. The number in the last column is at user's convenience. It differentiates between a set of regression equations employed by the user, giving the uranium grade as a function of the radioactivity.

The instrument code is as follows:

Radiometric instrument	Codes
simple geiger tube	GT
multiple geiger (scanner)	MG
simple scintillometer	SS
energy source differentiating scintillometer (multi-channel spectrometer)	ES

Fourth Column(†), TOTAL RADIOACTIVITY:

Entries in this column are limited to a maximum of a six digit number. This entry refers to the total radioactivity (Gamma Rays) of the segment, measured in counts per second, in cases where the instrument cannot differentiate between emitting sources.

Fifth Column(*), ASSAYING METHOD (FOR URANIUM)
and Sixth Column(†), URANIUM GRADE

These two columns are completed as a single pair. An *Assaying Method* must always be assigned, wherever a *Grade* is entered.

After typing the first (or any subsequent) entry and **R** in column 5, the *FEM* procedure (see instructions in step 16) can be applied, giving the user an opportunity to automatically enter into column 5 repetitive values, as column 6 (which can only be filled one at a time) is being completed.

Entries in column 5 are limited to any one character. It identifies the assaying method used to determine the grade of uranium. An appropriate code was assigned by ORAG:

Assaying method		Codes
no assay		0
radiometry only of core	— scanning	A
	— assaying	B
radiometry only of DH		C
chemical assay only	— fluorometry	D
	— colorimetry	E
	— volumetry	F
radiometric scan of core and chemical assay	— fluorometry	G
	— colorimetry	H
	— volumetry	I
radiometric assay of core and chemical assay	— fluorometry	J
	— colorimetry	K
	— volumetry	L
radiometry of DH and chemical assay of core cuttings	— fluorometry	M
	— colorimetry	N
	— volumetry	P
estimated grade using densities		Q
radiometry of DH and radiometric scan of core or cuttings		R

Assaying method (continued)	Codes
radiometry of DH and radiometric	
assay of core or cuttings	S
geologist's estimate	T
X - Ray fluorescence (XRF) assay	U
atomic absorption (not uranium)	V
delayed neutron activation	W
unknown assaying method	X

After completion of each entry in column 5 the cursor moves to column 6. Entries in this column are limited to a maximum of a four digit number, plus the decimal point (which must always be included as per example displayed on the screen). This entry refers to the grade of uranium of the core segment. The same unit code is used as in entry (6) on form TYPE = TITLE. No repetitive entries are possible in this column.

On typing **R** after the last entry of column 6, the cursor moves to column 7.

Seventh Column(†), URANIUM RADIOACTIVITY:

Entries in this column are limited to a maximum of a five digit number. This entry refers to the uranium radioactivity (Gamma Rays) in counts per second; these data can only be obtained from spectrometer readings.

On typing **R** after the last entry of column 7, message (c) appears at the bottom of the screen:

Message (c):

DATA MUST BE FOR THE DISTANCE FROM COLLAR TO .

TO END ENTER "9999.9"

The user now has the opportunity to skip all lines for which he has no entries. After answering message (c), by entering the relevant *from* → *to Distance from Collar* lengths (these must correspond to data shown in column 1) and after typing **R**, the cursor moves to column 8. The user can now enter the data, one line at a time. Message (c) reappears once the previously specified range has been filled up with data. Should no data be available, the user is to type **9999.9** and **R**. This initiates the data entry procedure for the next column.

Eighth Column(•), ASSAYING METHOD (FOR THORIUM)
and Ninth Column(†), THORIUM GRADE

These two columns are completed as a single pair. An *Assaying Method* must always be assigned, wherever a *Grade* is entered.

After typing the first (or any subsequent) entry and **R** in column 8, the *FEM* procedure (see instructions in step 16) can be applied, giving the user an opportunity to automatically enter into column 8 repetitive values, as column 9 (which can only be filled one at a time) is being completed.

Entries in column 8 are limited to any one character. It identifies the assaying method used to determine the grade of thorium. An appropriate code was assigned by ORAG. It is the same as used for column 5.

After completion of column 8, the cursor moves to column 9. Entries in this column are limited to a maximum of a four digit number, plus the decimal point (which must always be included as per example displayed on the screen). This entry refers to the grade of thorium of the core segment. The same unit code is used as in entry (6) on form TYPE = TITLE. No repetitive entries are possible in this column.

On typing **R** after the last entry of column 9, message (c) reappears and the above mentioned procedure can again be applied, before the cursor moves to column 10.

Tenth Column(†), THORIUM RADIOACTIVITY

Entries in this column are limited to a maximum of a five digit number. This entry refers to the thorium radioactivity (Gamma Rays) in counts per second; these data can only be obtained from spectrometer readings.

On typing **R** after the last entry of column 10, Fig. 9 reappears and the user is given the opportunity to correct form TYPEB DATA in line with the corresponding procedure given previously for form DAMH in steps 10, 11 and 12.

FINAL REMARK:

After completion of the last entry in the final operative column of Fig. 14, the user may either proceed with error corrections (see instructions at the end of step 6) or proceed as per step 7 (Fig. 6) except that on typing **N** and **R** step 19 follows.

APPENDIX 'E'

GUIDE TO COMPLETE

FORM TYPE = OTHER METALS (as per Fig. 16)

GENERAL REMARKS:

— This form is completed by column pairs (and not rowwise, as form TYPE = TITLE).

— The data previously typed into entry (7) of *Appendix 'A'* control the number of columns (from 3 to 12) that have to be filled (e.g., for one metal, only column pair 3/4; for two metals, column pairs 3/4 and 5/6, etc.).

— A maximum of 600 entries can be typed into each column. The cursor will automatically move from one column to the next, as the number of entries in each column equals the number of entries contained in column 1. The entries in every column must be based upon the corresponding *Distance from Collar* entries in column 3 in form TYPEA DATA (Fig. 12). All columns can only contain as many entries as this column 3.

— The screen displays only 14 lines of entry at any one time. On completion of these, another 14 blank lines of entry will appear (up to a maximum of 600). However:

(a) should the user enter more than the maximum permissible number of characters in a single entry, the cursor will advance to the position of the last character typed. Now two cases can arise:

(1) the cursor has not reached the last character that can be displayed on a single line of the screen. On typing **R** all excess (i.e., in excess of what the program allows for the entry in question) characters are ignored and the cursor advances to the beginning of the subsequent entry. Should the remaining (i.e., truncated) entry in question be incorrect, or incomplete, proceed as per point (d) below.

(2) the cursor has reached the last character that can be displayed on a single line of the screen. On typing **R** the cursor reverts to the beginning of the entry in question (i.e., the one with too many characters). The entry can now be reentered.

Note that entries that have been overtyped on the screen during cases (1) and (2) above, are NOT affected on the actual data file, only on the screen display.

(b) a warning sound will be emitted by the terminal after typing **R**, if a character, which is unacceptable to the program, is typed into a specific entry. In this case the cursor moves to the front of this specific entry, giving the user a chance to retype the entry;

(c) should an error be noted BEFORE typing **R**, then an appropriate correction can still

be effected. This is done by moving the cursor backwards (by pressing the *Backspace Key* to erase all characters up to and including, the first incorrect one). Now the user may enter the correct information, by retyping al the necessary characters;

(d) should **R** have been typed before noticing the incorrect entry, see correction procedure given in steps 10 to 12.

— All entries indicated by a $^{(\ddagger)}$ are optional entries.

— All entries indicated by a $^{(*)}$ are key entries and must be completed. Otherwise the program is not able to produce the data file. In case of key entries which involve the use of codes, the user must be careful to assign the correct code. Otherwise the data file produced will be incorrect.

— All entries indicated by a $^{(\dagger)}$ are important (but not key) entries. If these entries are not completed, the program will produce an incomplete data file.

DATA ENTRY PROCEDURE:

Before completing form TYPE = OTHER METALS (Fig. 16) the user must first reply to message (a):

Message (a):

DO YOU HAVE DATA FOR METAL 1?

ANSWER " Y " OR " N "

On typing **N** and **R**, in reply to message (a), the program advances to the subsequent column pair, or to step 10.

On typing **Y** and **R**, in reply to message (a), form TYPE = OTHER METALS (Fig. 16) appears, including message (b).

Message (b):

DATA MUST BE FOR THE DISTANCE FROM COLLAR TO .

TO END "ENTER 9999.9"

Now the column pair for metal 1 can be completed. Message (b) provides the user with the opportunity to skip all lines for which he has no entries. After answering message (b), by entering the relevant *from* → *to Distance from Collar* lengths (these must correspond to data shown in column 1) and after typing **R**, the cursor moves

to column 3. The user can now enter the data in column pair 3 and 4, one line at a time. Message (b) reappears once the previously specified range has been filled up with data. Should no data be available, the user is to type **9999.9** and **R**. This initiates the data entry procedure for the next column pair.

After completion of column pair 3 and 4, or of any subsequent column pairs, message (a) reappears, except that instead of METAL 1 (covered by columns 3 and 4), METAL 2 to METAL 5 will be referred to, as long as the appropriate code was entered in entry (7) of *Appendix 'A'*. The same data entry procedure as described above for column pair 3 and 4 is now used for the subsequent column pairs.

First Column, DISTANCE FROM COLLAR
and Second Column, SAMPLE NUMBER:

These columns are completed automatically, with the program entering the same data as were previously typed into columns 3 and 1 of form *TYPEA DATA* (Fig. 12).

None of the subsequent columns can contain more entries than are shown in these first two columns.

Third Column(*), ASSAYING METHOD (FOR METAL 1)
and Fourth Column(†), % GRADE (FOR METAL 1):

These two columns are completed as a single pair. An *Assaying Method* must always be assigned, wherever a *Grade* is entered.

Entries in column 3 are limited to any one character. It identifies the assaying method(s) used to determine the grade of metal 1. For this purpose a code was assigned by ORAG. It is the same one, as shown for column 5 of *Appendix 'D'*. After typing the first (or any subsequent) entry, and **R**, in column 3, the *FEM* procedure (see instructions in step 16) can be applied, giving the user an opportunity to automatically enter into column 3 repetitive data, as column 4 (which can be only filled one at a time) is being completed.

After completion of each entry in column 3, the cursor moves to column 4 (if the *FEM* procedure was not used). Entries in this column are limited to a maximum of a four digit number, plus the decimal point (which must always be included, as per example displayed on the screen). This entry refers to the grade of METAL 1. The grade must be expressed as percentages, except in the case of noble metals where

the grades are expressed in troy oz/short ton or in grams/metric tonne, depending on the code used for the OTHER METAL [see entry 7, *Appendix 'A'*].

Great care must be taken to ensure that metals 1, 2, 3, 4 and 5 are entered in the same order as their respective codes in the above mentioned entry (7).

After completing the last entry in column 4, and after typing **R**, two cases can arise:

Case 1

The codes typed into entry (7) of *Appendix 'A'* indicate that no more *OTHER METALS* are to be considered.

In this case Fig. 9 (step 10) reappears, and the user is given the opportunity to correct form *TYPE = OTHER METALS* in line with the corresponding procedure given previously for form *DAMH* in step 10, 11 and 12.

Case 2

The codes typed into entry (7) of *Appendix 'A'* indicate that more *OTHER METALS* are to be considered.

In this case the process described previously for columns 3 and 4 is to be repeated for column pair 5 and 6 (and subsequent column pairs, if necessary).

FINAL REMARK:

The foregoing case 2 procedure is repeated as long as further *OTHER METALS* are to be considered. Once they have all been considered (i.e., five as a maximum) and the final operative column is completed, the situation as described above for case 1 has been reached.

APPENDIX 'F'

NUMERICAL EXAMPLE ILLUSTRATING THE DATA ENTRY PROCEDURE

GENERAL REMARKS:

— This appendix visually illustrates, with the help of photographs taken of a terminal screen, a complete example; the sequence of the data entry procedure follows exactly the previously described process.

Fig. (F-1a) Data entry at the computer terminal

— To assist the prospective user, the step numbering sequence used in this report is repeated. This will assist the user to tie in the Figures in *Appendix F* with the corresponding steps in the main report.

— The illustrative example (fictitious) deals with the use of:

(a) a new file referred to by the name **AAA12T32.DAT**;

(b) a new, vertical, surface, **BQ** size drillhole (DH), called **AAA0001** as per the company number **AB-05**; a 10 ft long **BW** size initial casing was installed; all unit codes are in the imperial system; it is drilled in a Uranium-Thorium deposit, which also contains Nickel; the DH deviation measurements must be entered in the form *DAMH*; the deviation is obtained with a magnetic tropari single-shot instrument; the survey results (dep., lat., elev.) are available;

(c) both singular and repetitive data, as well as with an erroneous entry.

— No data were available, wherever entries were left blank in any of the five *Forms*.

ILLUSTRATIVE EXAMPLE

Step 1: *Accessing the program*

Type **2** and **R** [Fig. (F-1)].

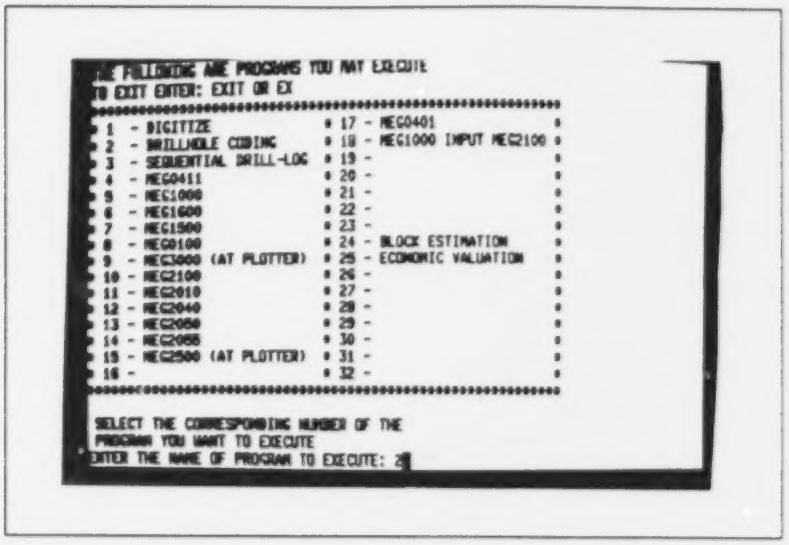


Fig. (F-1) Selection of the **CDDE/1.0** program

Step 2: *Identification of the File Name*

This example uses the file name **AAA12T32.DAT** [Fig. (F-2)].

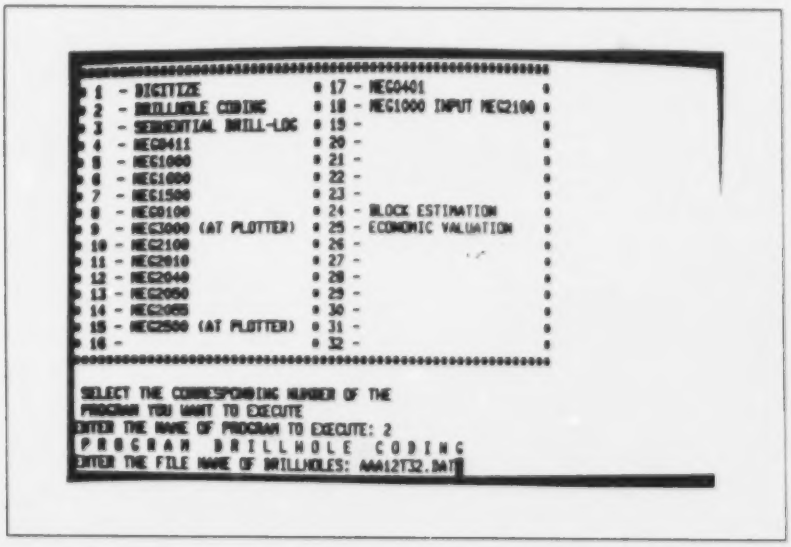


Fig. (F-2) Identification of file name **AAA12T32.DAT**

Step 3: *Determination whether Step 2 file name is a new one*

This example uses the alternative **N** [Fig. (F-3)]

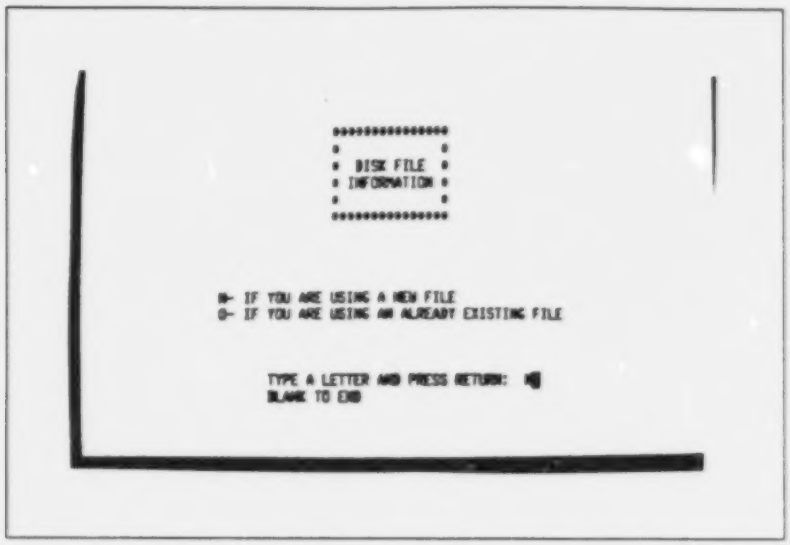

DISK FILE
INFORMATION
N- IF YOU ARE USING A NEW FILE
O- IF YOU ARE USING AN ALREADY EXISTING FILE
TYPE A LETTER AND PRESS RETURN:
BLANK TO END

Fig. (F-3) Selection of a new file

Step 4: *Determination whether (DH) now being filed is a new one or continuation of a previously filed DH*

This example uses the alternative **S** [Fig. (F-4)].

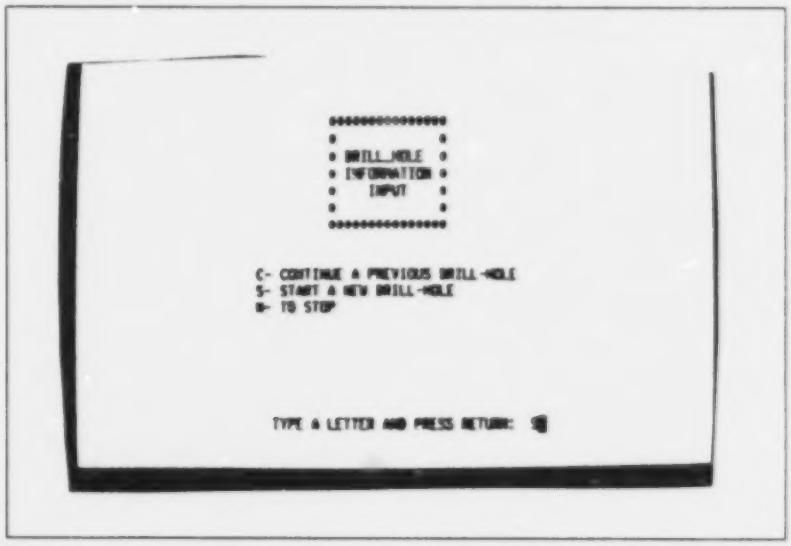


Fig. (F-4) Selection of alternative **S**

Step 5: *Information identifying the form which will be displayed on the screen in step 6*

As indicated in the report, at this point the screen displays, Fig.4.

Step 6: *Data entry* — form *TITLE*

This example uses the fictitious DH data shown in Fig. (F-5).

It also shows [Fig. (F-6a) and Fig. (F-6b)] the correction procedure in case of an error in *Entry 17*.

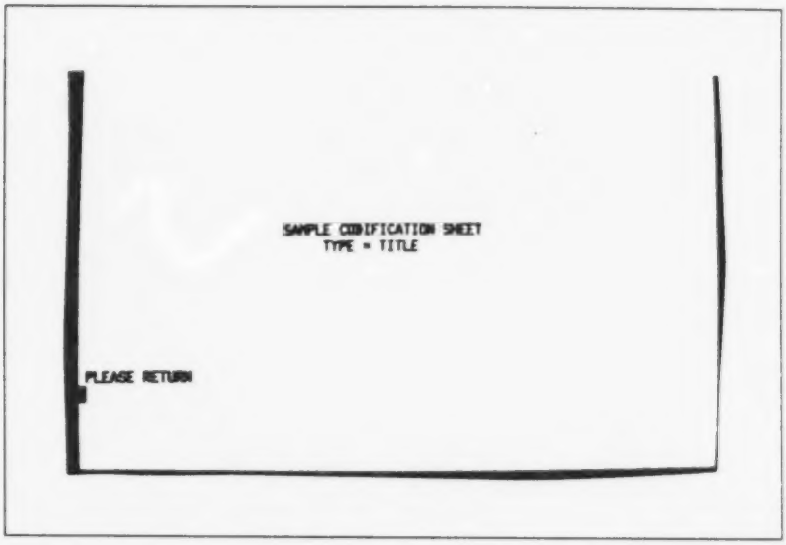


Fig. (F-5) Fictitious data entered into form *TITLE*

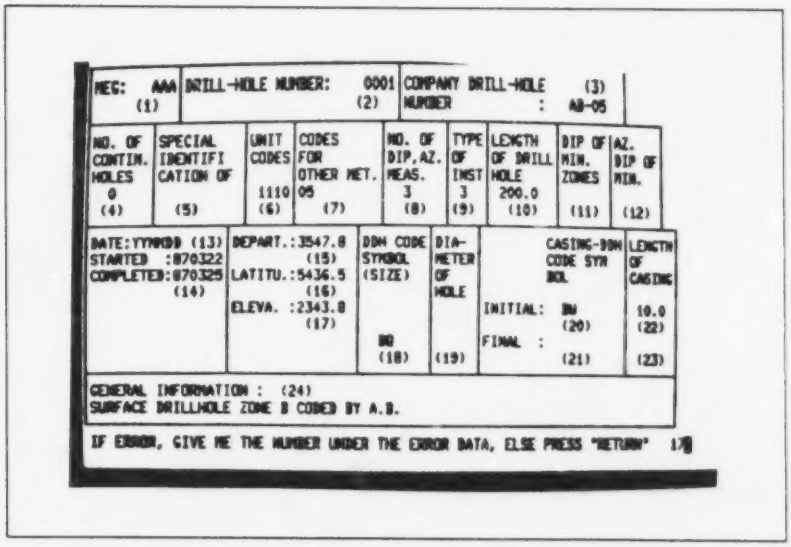

REG: AAA (1)
DRILL-HOLE NUMBER: 0001 (2)
COMPANY DRILL-HOLE NUMBER : (3) AB-05
NO. OF CONTIN. HOLES 0 (4)
SPECIAL IDENTIFI CATION OF (5)
UNIT CODES 1110 (6)
CODES FOR OTHER MET. 05 (7)
NO. OF DIP, AZ. MEAS. 3 (8)
TYPE OF INST 3 (9)
LENGTH OF DRILL HOLE 200.0 (10)
DIP OF MIN. ZONES (11)
AZ. DIP OF MIN. (12)
DATE: YYMMDD (13)
STARTED : 870322
COMPLETED: 870325 (14)
DEPART.: 3547.8 (15)
LATITU.: 5436.5 (16)
ELEVA. : 2343.8 (17)
DDH CODE SYMBOL (SIZE) BQ (18)
DIA-METER OF HOLE (19)
CASING-DDH CODE SYM BOL
INITIAL: BW (20)
FINAL : (21)
LENGTH OF CASING 10.0 (22) (23)
GENERAL INFORMATION : (24)
SURFACE DRILLHOLE ZONE B CODED BY A.B.
IF ERROR, GIVE ME THE NUMBER UNDER THE ERROR DATA, ELSE PRESS "RETURN" 17

Fig. (F-6a) Selection of *Entry 17* for correction procedure

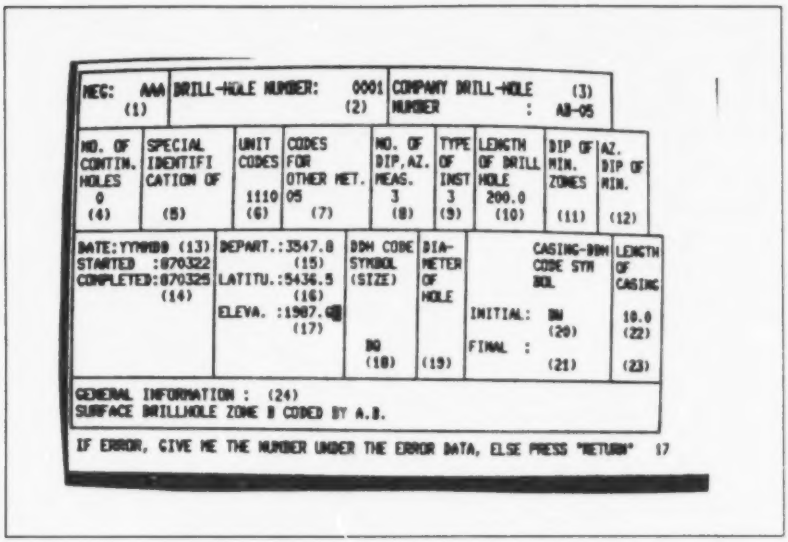

REG: AAA (1)
DRILL-HOLE NUMBER: 0001 (2)
COMPANY DRILL-HOLE NUMBER : (3) AB-05
NO. OF CONTIN. HOLES 0 (4)
SPECIAL IDENTIFI CATION OF (5)
UNIT CODES 1110 (6)
CODES FOR OTHER MET. 05 (7)
NO. OF DIP,AZ. MEAS. 3 (8)
TYPE OF INST 3 (9)
LENGTH OF DRILL HOLE 200.0 (10)
DIP OF MIN. ZONES (11)
AZ. DIP OF MIN. (12)
DATE:YYMMDD (13)
STARTED :870322
COMPLETED:870325 (14)
DEPART.:3547.8 (15)
LATITU.:5436.5 (16)
ELEVA. :1987. (17)
DDH CODE SYMBOL (SIZE) BQ (18)
DIA-METER OF HOLE (19)
CASING-DDH CODE SYM BOL
INITIAL: BW (20)
FINAL : (21)
LENGTH OF CASING 10.0 (22) (23)
GENERAL INFORMATION : (24)
SURFACE DRILLHOLE ZONE B CODED BY A.B.
IF ERROR, GIVE ME THE NUMBER UNDER THE ERROR DATA, ELSE PRESS "RETURN" 17

Fig. (F-6b) Retyping of *Entry 17*

Step 7: *Provision of option to continue or to interrupt the procedure*

This example uses the alternative N [Fig. (F-7)].

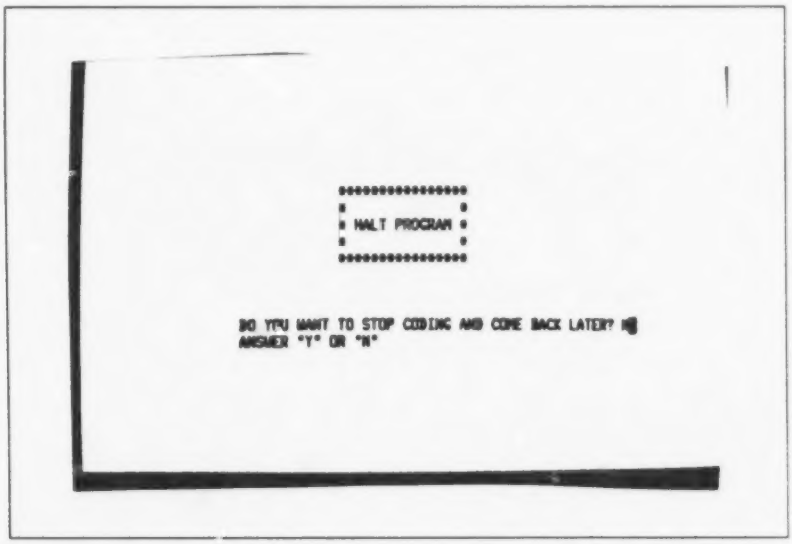


Fig. (F-7) Selection of alternative N

Step 8: *Information identifying the form which will be displayed on the screen in step 9*

As indicated in the report, at this point the screen displays Fig. 7.

Step 9: *Data entry* — form *DAMH*

This example uses the fictitious DH data entered in [Fig. (F-8)]. It is assumed that no errors were detected at this stage. Therefore alternative N [Fig. (F-9)] is chosen in step 10, and steps 11 and 12 are skipped at this stage.

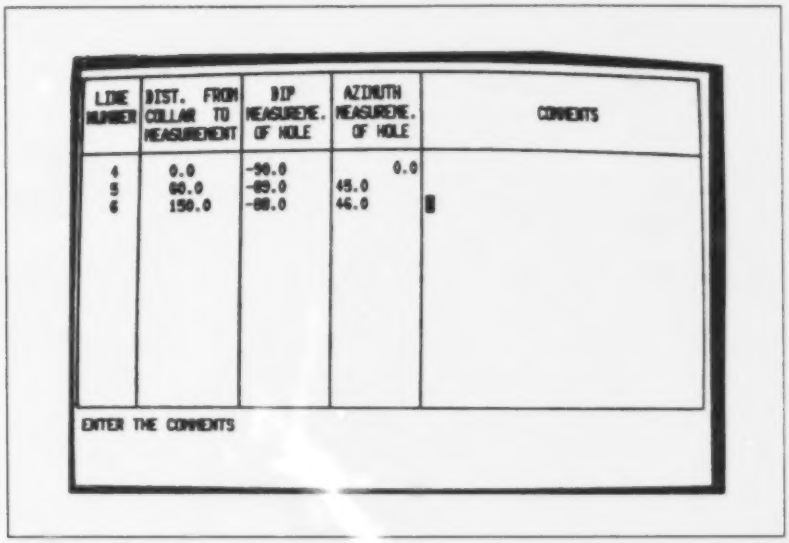


Fig. (F-8) Actual data entered into form *DAMH*

Step 10: *Selection of type of correction required (in step 11) on form DAMH*

Step 11 and Step 12: skipped, as indicated in step 9.

CORRECTIONS
C- CHANGE AND CHECK DATA ENTRIES
D- DELETE A LINE
I- INTERCAL A LINE
N- NO CHANGES
FOR THE DAMH DATA : N
** TYPE A LETTER AND PRESS RETURN **

Fig. (F-9) Selection of alternative N

Step 13: *Provision of option to continue or to interrupt the procedure*

At this point the screen displays Fig. (F-7). This example uses the alternative **N**.

Step 14: *Information identifying the form which will be displayed on the screen in step 15*

As indicated in the report at this point the screen displays Fig. 11.

Step 15:

Identification of columns in which a repetition of the data is expected — form TYPEA DATA

This example illustates the case where **C** is assigned to all columns where this is possible [Fig. (F-10a)].

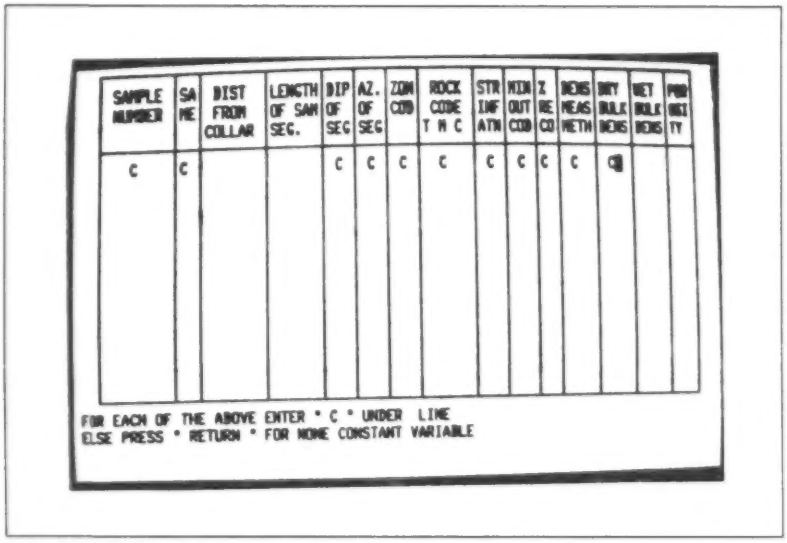

SAMPLE NUMBER
SA ME
DIST FROM COLLAR
LENGTH OF SAM SEG.
DIP OF SEG
AZ. OF SEG
ZON COD
ROCK CODE T M C
STR INF ATN
MIN OUT COD
Z RE CO
BEMS MEAS METH
BRY RULE BEMS
WET RULE BEMS
POR OSI TY
C C C C C C C C C C C C
FOR EACH OF THE ABOVE ENTER * C * UNDER LINE
ELSE PRESS * RETURN * FOR NONE CONSTANT VARIABLE

Fig. (F-10a) Form *TYPEA DATA* — data repetition, **C**, entered wherever possible

Step 16: *Data entry* — form *TYPEA DATA*

(a) Data entry in columns 3 and 4 [Fig. (F-10b)].

(b) Entry of the last data in column 4 [Fig. (F-10c)].

(c) Use of the *FEM* procedure in column 11: Fig. (F-10d) with message (a); Fig. (F-10e) with message (b); Fig. (F-10f) with all repetitive data entered.

(d) Data entry in column 1 [Fig. (F-10g)]. Note that the **0** in the first line of column 11 results in an automatic **00000000** entry in the first line of column 1.

(e) First entry in column 1 [Fig. (F-10h)]. Note that, by mistake, the same value is entered twice, the second one being the correct entry. This will have to be corrected later (see steps 10, 11 and 12). Moreover, repetitive characters follow the first correct entry (in line 5). Therefore, the *FEM* procedure is used: note Message (b) at the bottom of the screen.

(f) Use of the fast sub-procedure for repetitive characters in column 1: Fig. (F-10i).

(g) Entry of the last non-repetitive character in column 1 [Fig. (F-10j)].

(h) Entry of the rock codes in the first sub-column of column 8 [Fig. (F-10k)].

(i) Column 9 is skipped by entering **A** in reply to the message at the bottom of the screen [Fig. (F-10 *l*)]. The same process is used to skip column 10.

(j) Questions providing the opportunity for skipping (if desired) any one of the following : columns 12, 13, 14 and 15 [Fig. (F-10m)].

(k) Entry of data in columns 13 and 15; both columns are filled one line at a time [Fig. (F-10n)].

(m) Step 10, Step 11 and Step 12 for error correction, as referred to in point (e) above [Fig. (F-9), (F-11a) and (F-11b)].

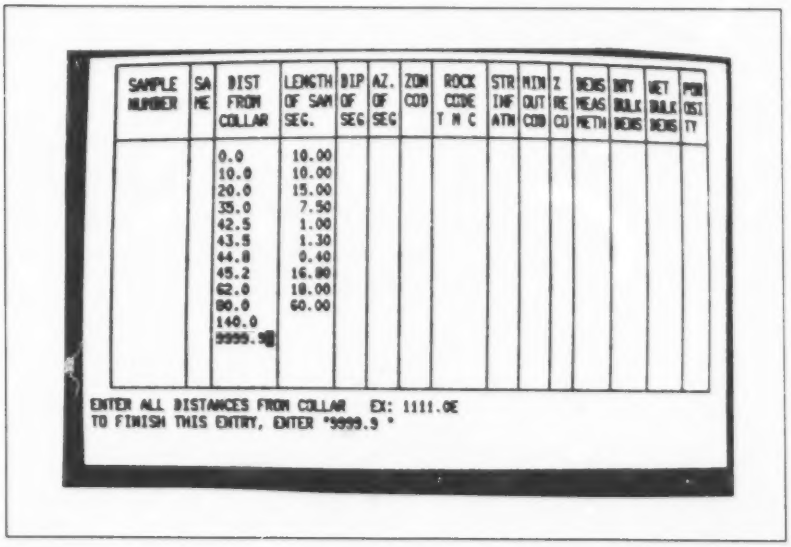


Fig. (F-10b) Data entry in form *TYPEA DATA*, columns 3 and 4

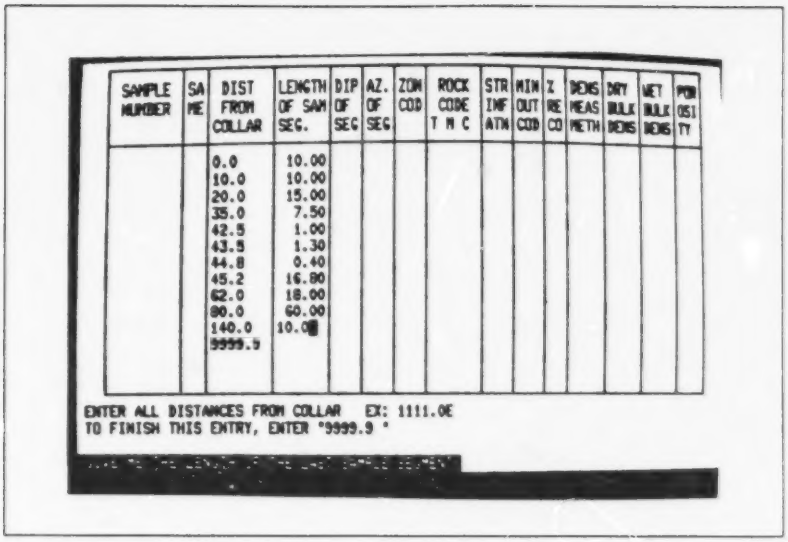


Fig. (F-10c) Form *TYPEA DATA* — entry of the last data in column 4

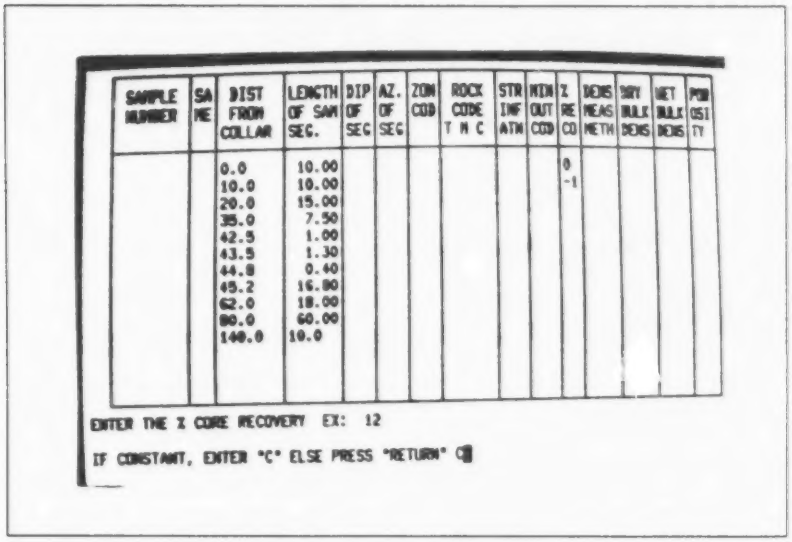


Fig. (F-10d) Form *TYPEA DATA* — *FEM* procedure message (a)

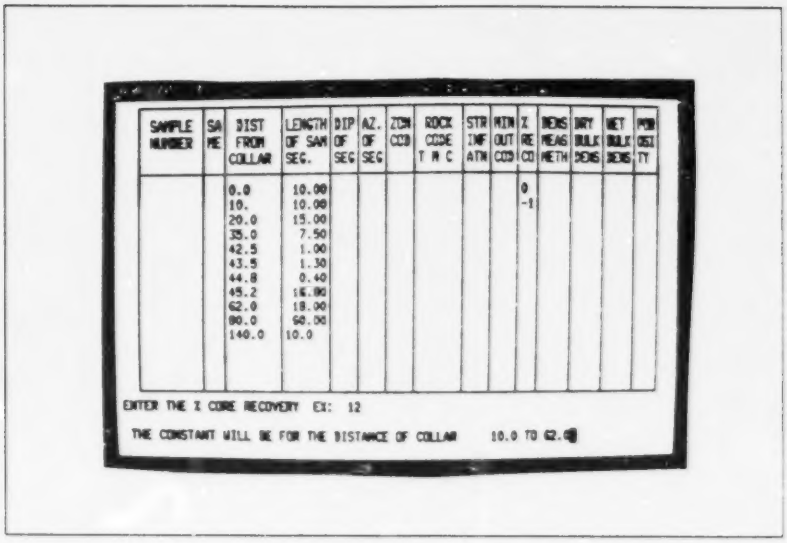


Fig. (F-10e) Form *TYPEA DATA — FEM* procedure message (b)

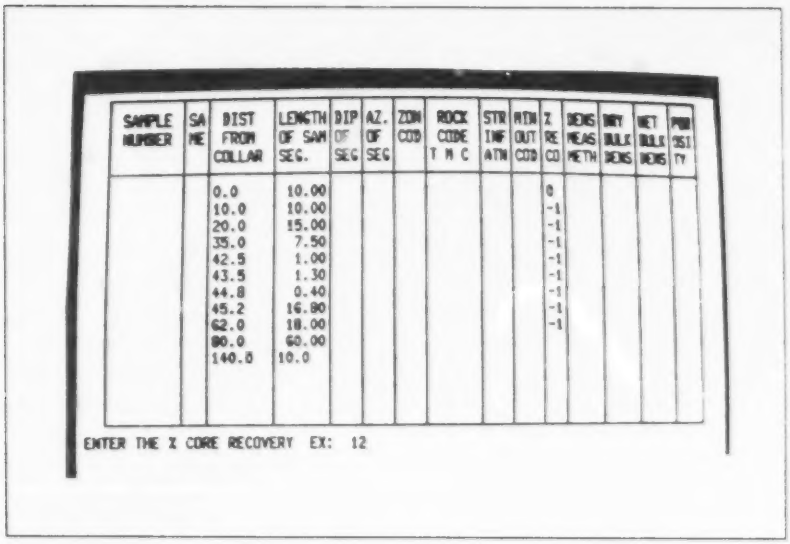


Fig. (F-10f) Form *TYPEA DATA* — with all repetitive data entered

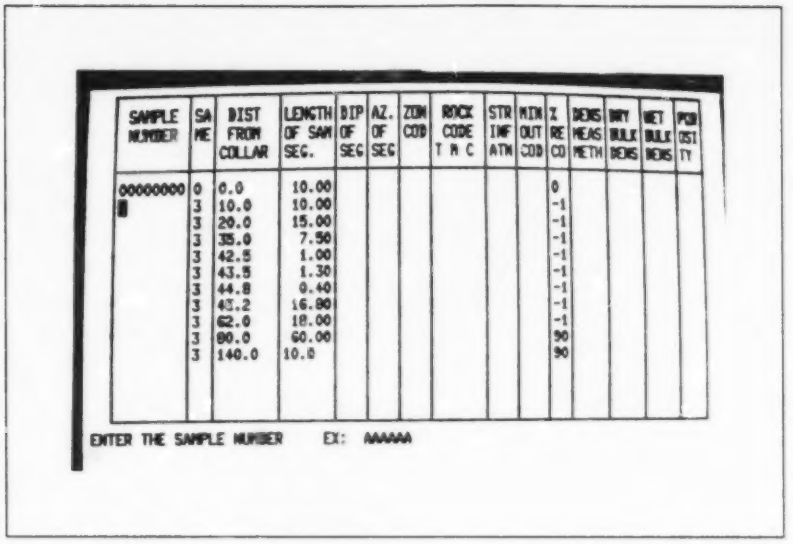


Fig. (F-10g) Form *TYPEA DATA* — automatic entry in the first line of column 1

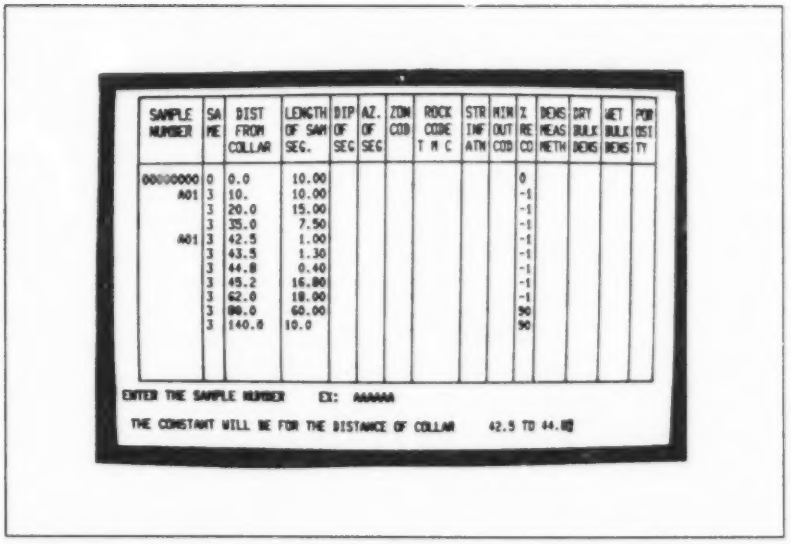


Fig. (F-10h) Form *TYPEA DATA* — first entry in column 1

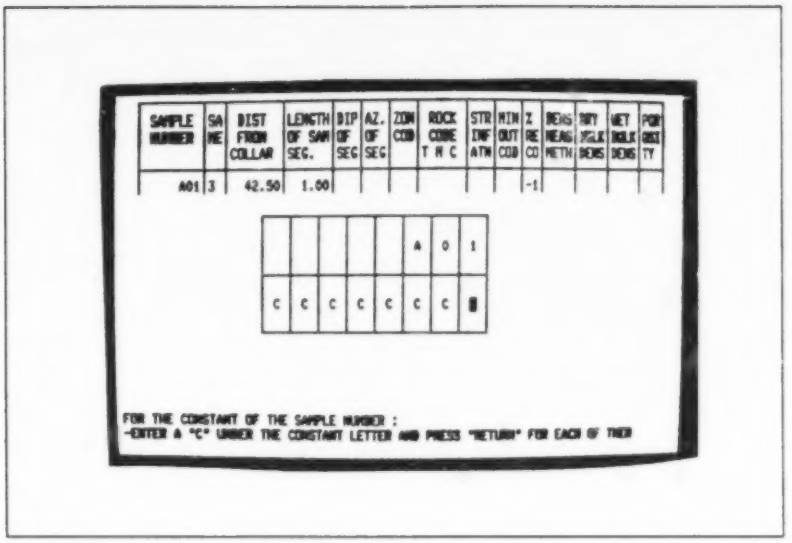

SAMPLE NUMBER
SA ME
DIST FROM COLLAR
LENGTH OF SAM SEG.
DIP OF SEG
AZ. OF SEG
ZON CODE
ROCK CODE T M C
STR INF ATN
MIN OUT COD
I RE CO
DENS MEAS METH
DRY BULK DENS
WET BULK DENS
POR OSI TY
A01 3 42.50 1.00 -1
A 0 1
C C C C C C C
FOR THE CONSTANT OF THE SAMPLE NUMBER :
-ENTER A "C" UNDER THE CONSTANT LETTER AND PRESS "RETURN" FOR EACH OF THEM

Fig. (F-10i) Form *TYPEA DATA* —
character repetition, **C** entered wherever necessary

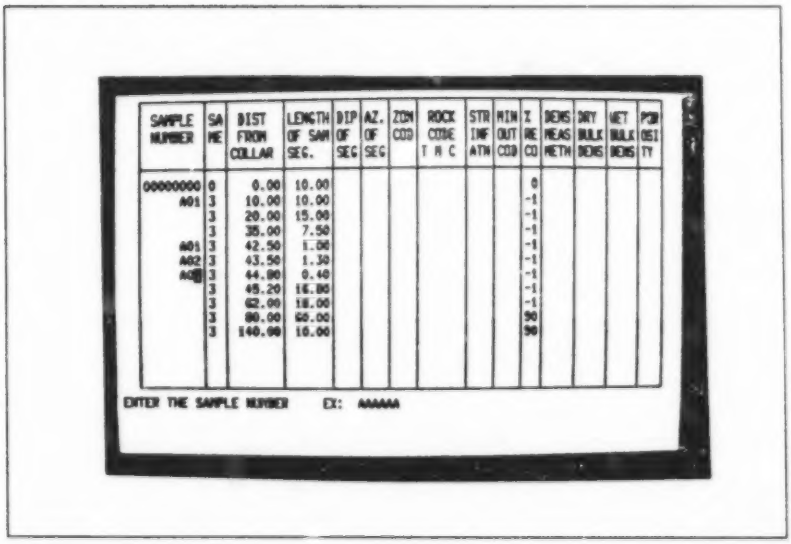
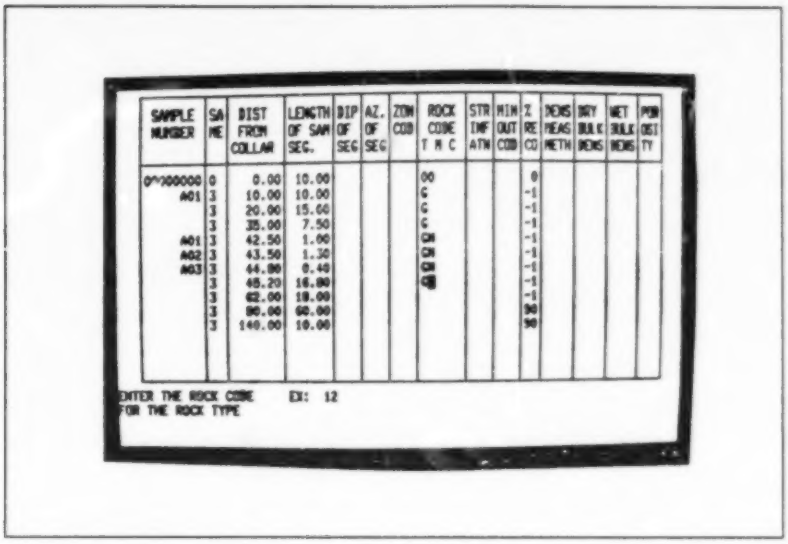


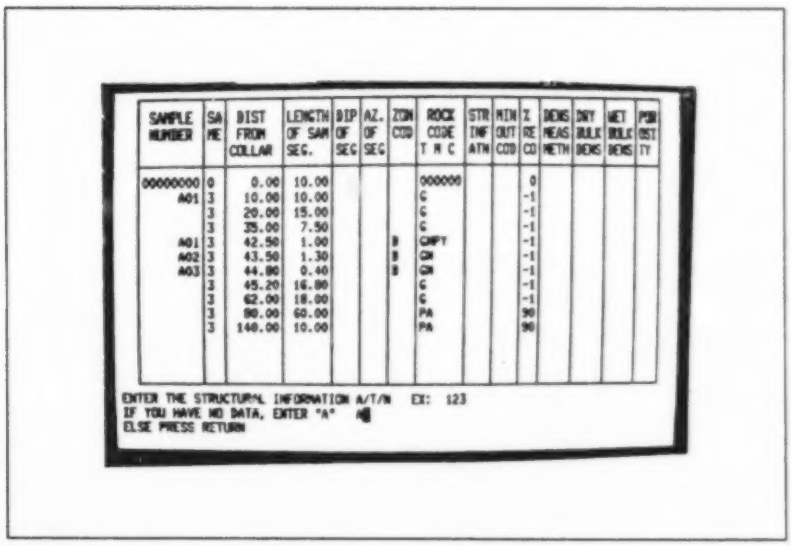
Fig. (F-10j) Form *TYPEA DATA* —
entry of the last non-repetitive character in column 1



SAMPLE NUMBER	SAME	DIST FROM COLLAR	LENGTH OF SAM SEG.	DIP OF SEG	AZ. OF SEG	ZON COD	ROCK CODE T M C	STR INF ATN	MIN OUT COD	I RE CO	DENS MEAS METH	DRY BULK DENS	WET BULK DENS	PER OSI TY
0^)00000	0	0.00	10.00				00			0				
A01	3	10.00	10.00				G			-1				
	3	20.00	15.00				G			-1				
	3	35.00	7.50				G			-1				
A01	3	42.50	1.00				GR			-1				
A02	3	43.50	1.30				GR			-1				
A03	3	44.80	0.40				GR			-1				
	3	45.20	16.80				G			-1				
	3	62.00	18.00				G			-1				
	3	80.00	60.00				PA			90				
	3	140.00	10.00				PA			90				

ENTER THE ROCK CODE FOR THE ROCK TYPE EX: 12

Fig. (F-10k) Form *TYPEA DATA* — entry of the rock code in the first sub-column of column 8



SAMPLE NUMBER	SAME	DIST FROM COLLAR	LENGTH OF SAM SEG.	DIP OF SEG	AZ. OF SEG	ZON COD	ROCK CODE T M C	STR INF ATN	MIN OUT COD	I RE CO	DENS MEAS METH	DRY BULK DENS	WET BULK DENS	PER OSI TY
00000000	0	0.00	10.00				000000			0				
A01	3	10.00	10.00				G			-1				
	3	20.00	15.00				G			-1				
	3	35.00	7.50				G			-1				
A01	3	42.50	1.00			B	CHPT			-1				
A02	3	43.50	1.30			B	GR			-1				
A03	3	44.80	0.40			B	GR			-1				
	3	45.20	16.80				G			-1				
	3	62.00	18.00				G			-1				
	3	80.00	60.00				PA			90				
	3	140.00	10.00				PA			90				

ENTER THE STRUCTURAL INFORMATION A/T/N EX: 123
IF YOU HAVE NO DATA, ENTER "A" A
ELSE PRESS RETURN

Fig. (F-10 *l*) Form *TYPEA DATA* — **A** entered to skip column 9

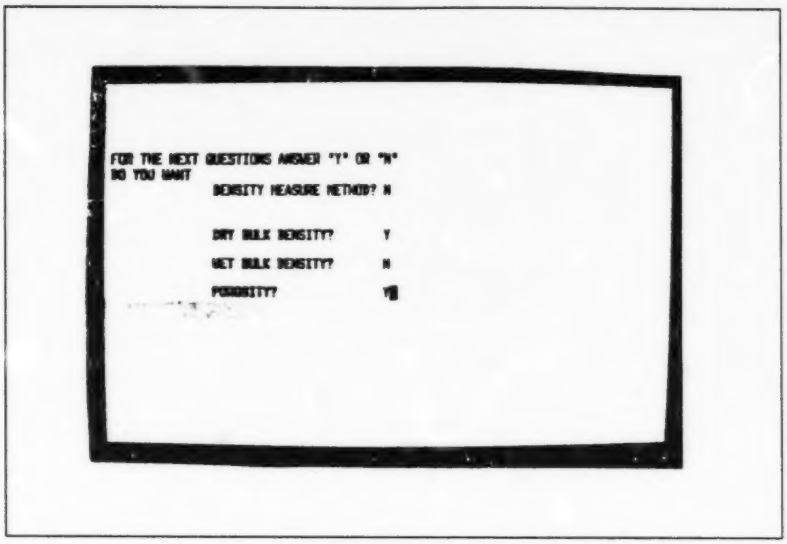


Fig. (F-10m) Form *TYPEA DATA* —
N and **Y** entered to skip/retain the appropriate columns

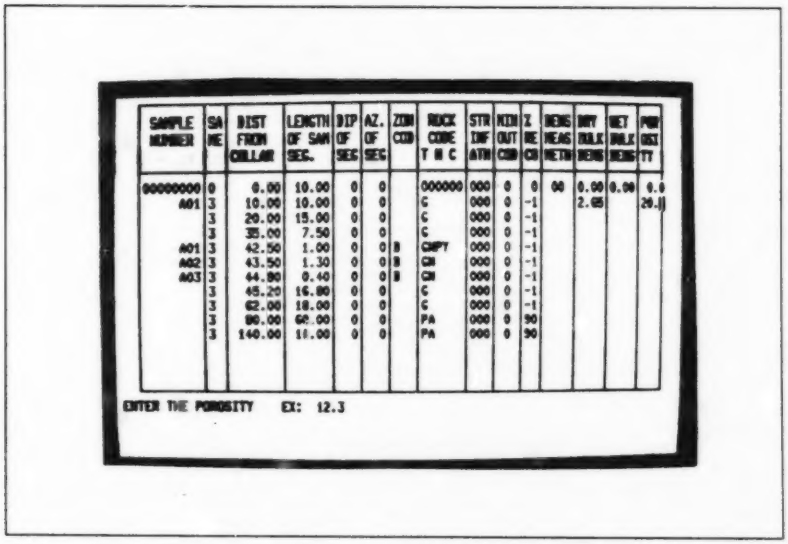


Fig. (F-10n) Form *TYPEA DATA* — data entry in columns 13 and 15

Step 10: *Selection of type of correction required (in step 11) on the form TYPEA DATA*
On completing form *TYPEA DATA*, the screen displays Fig. (F-9). Since, as mentioned in step 16, point (e), an error in column 1 needs to be corrected, alternative **C** is typed.

Step 11: *Selection of line location for the first correction on the form TYPEA DATA*

At this point, the screen displays Fig. (F-11a). In this example alternative B is used.

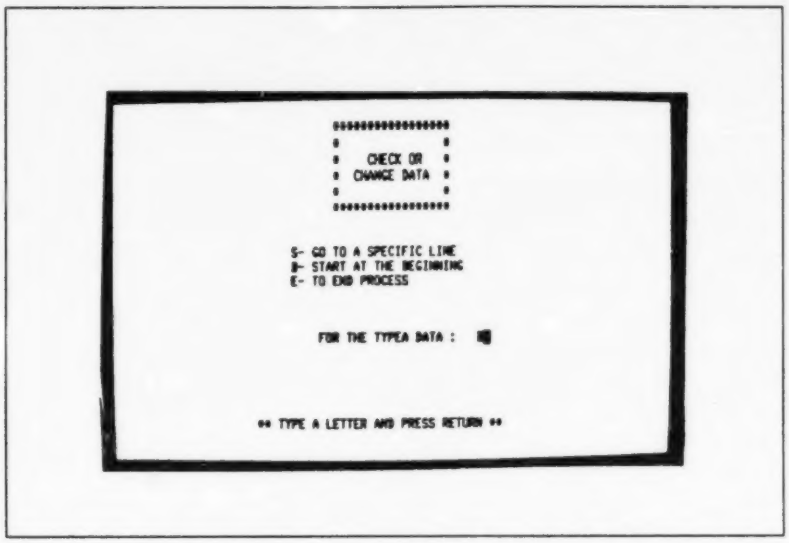

CHECK OR
CHANGE DATA
S- GO TO A SPECIFIC LINE
B- START AT THE BEGINNING
E- TO END PROCESS
FOR THE TYPEA DATA :
** TYPE A LETTER AND PRESS RETURN **

Fig. (F-11a) Selection of the alternative B

Step 12: *Correction of errors on form TYPEA DATA*

This example illustrates correction of the second line of entry in what was previously referred to as column 1, but is now, in Fig. (F-11b), numbered as column 2.

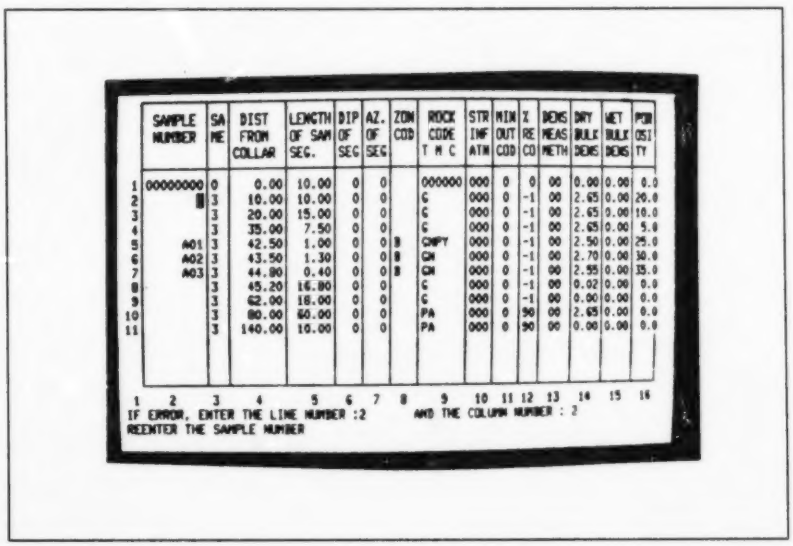


Fig. (F-11b) Correction of an entry in form *TYPEA DATA*, at location line #2 and column #2

Having completed the necessary error correction in Step 10, Step 11 and Step 12, the program now advances to Step 17.

Step 17: *Provision of option to continue or to interrupt the procedure*

At this point the screen displays Fig. (F-7). This example uses the alternative **N**.

Step 18: *Information identifying the form which will be displayed on the screen in step 19*

As indicated in the report at this point the screen displays Fig. 13.

Step 19: *Data entry — form TYPEB DATA*

As mentioned in *Appendix 'D'* a series of messages appear on the screen at this point to speed up data entry by providing an opportunity to skip those columns for which no data are available. In the present example columns 3, 4, 7 and 10 are skipped by typing **N** at the appropriate juncture, as shown in Figures (F-12a), (F-12b), (F-12f) and (F-12j). Wherever data are available, **Y** is typed (instead of **N**). In the present example this applies to columns 5, 6, 8 and 9, as shown in Figures (F-12c), (F-12d), (F-12e), (F-12g), and (F-12h). This procedure is summarized hereunder:

(a) Message for column 3 [Fig. (F-12a)]
(b) Message for column 4 [Fig. (F-12b)]
(c) Message for column pair 5 and 6 [Fig. (F-12c)]
(d) Entry of the first data in column 5, with the *FEM* message (step 16) at the bottom of the screen [Fig. (F-12d)]. In this example the repetitive data are *from* 42.5 → *to* 44.8 ft from the collar.
(e) Data entry in column pair 5 and 6 [Fig. (F-12e)]
(f) Message for column 7 [Fig. (F-12f)]
(g) Message for column pair 8 and 9 [Fig. (F-12g)]
(h) Message for skipping all lines for which the user has no entries [Fig. (F-12h)]. In this example no data exist *from* 0.0 → *to* 42.5 ft from the collar.
(i) Data entry in column pair 8 and 9, Fig. (F-12i), utilizing the message of point (h)
(j) Message for column 10 [Fig. (F-12j)]

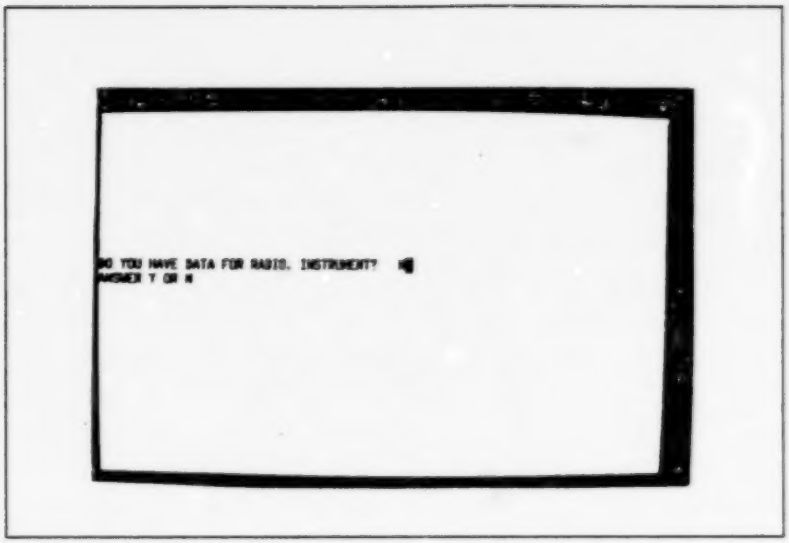


Fig. (F-12a) Form *TYPEB DATA* — selection of alternative **N**

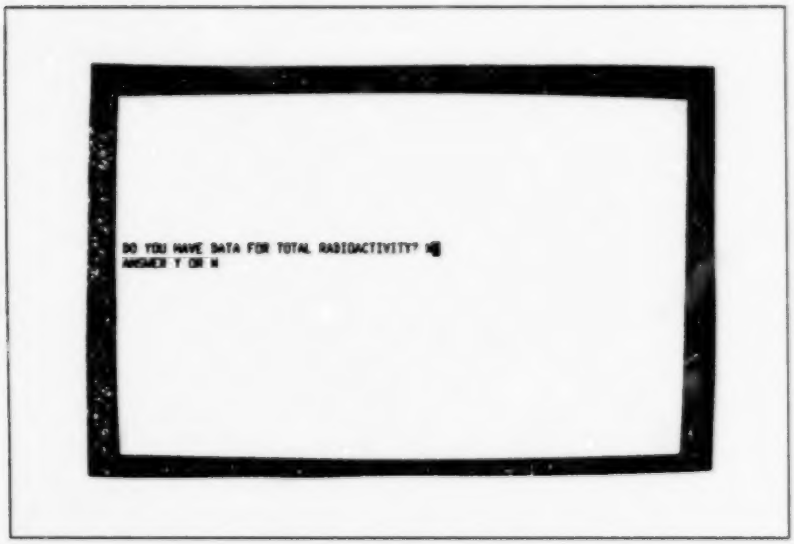


Fig. (F-12b) Form *TYPEB DATA* — selection of alternative **N**

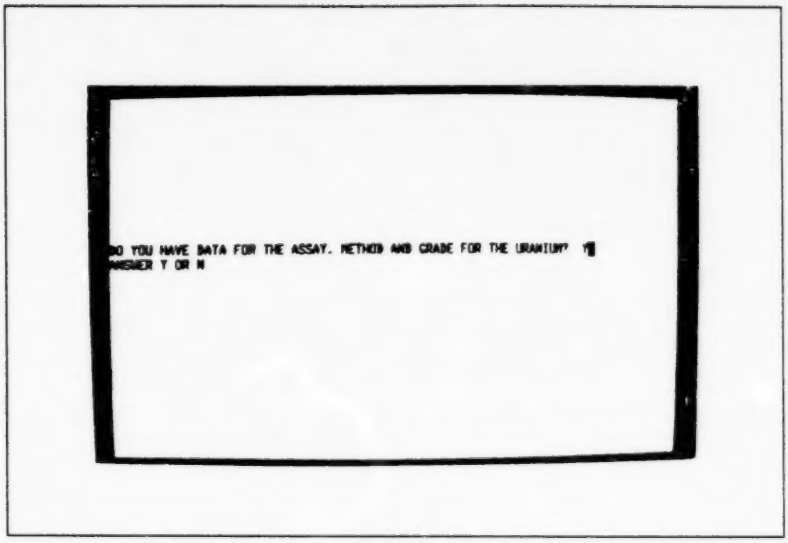


Fig. (F-12c) Form *TYPEB DATA* — selection of alternative **Y**

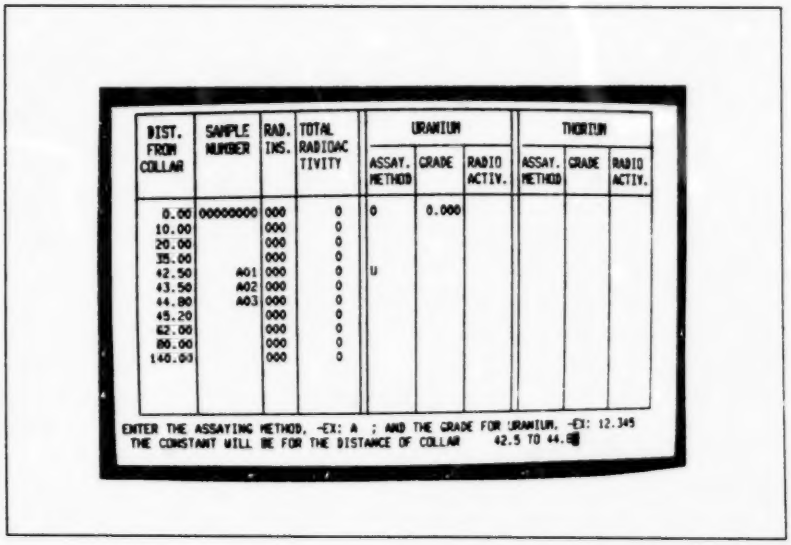


Fig. (F-12d) Form *TYPEB DATA* — entry of the first data in column 5

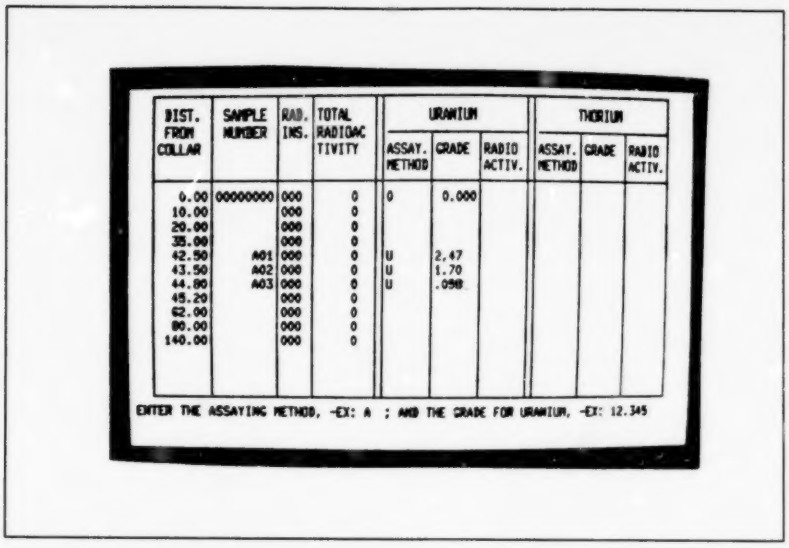


Fig. (F-12e) Form *TYPEB DATA* —
data entry in column pair 5 and 6

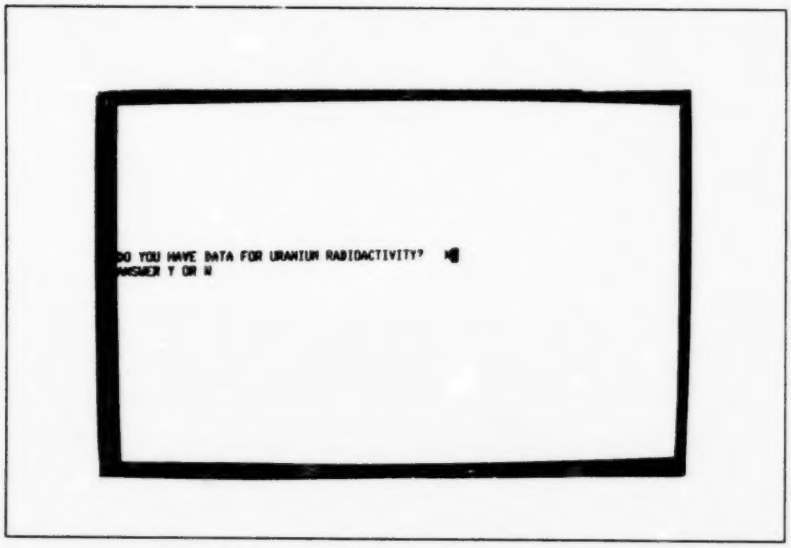


Fig. (F-12f) Form *TYPEB DATA* — selection of alternative **N**

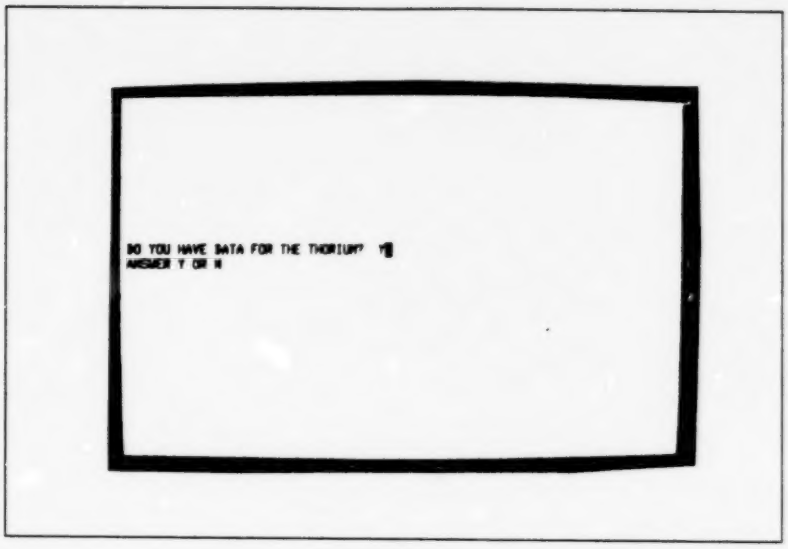


Fig. (F-12g) Form *TYPEB DATA* — selection of alternative **Y**

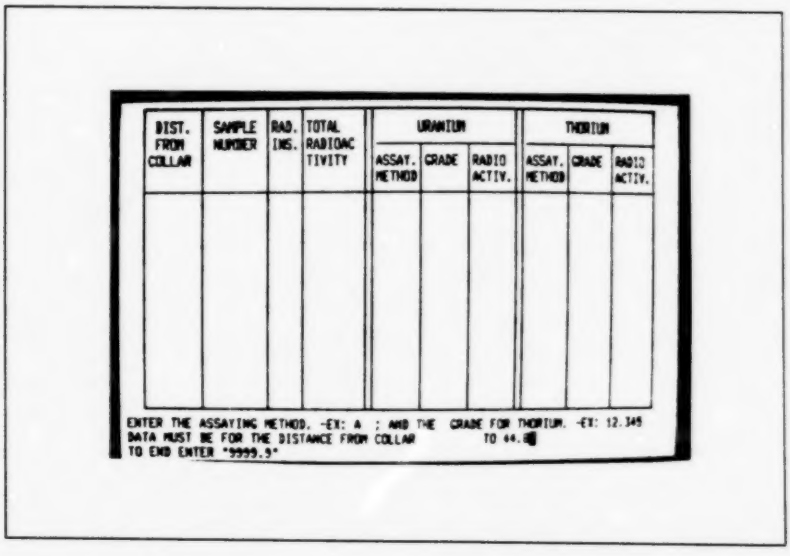


Fig. (F-12h) Form *TYPEB DATA* —
entry of the relevant *from* → *to Distance from Collar* lengths

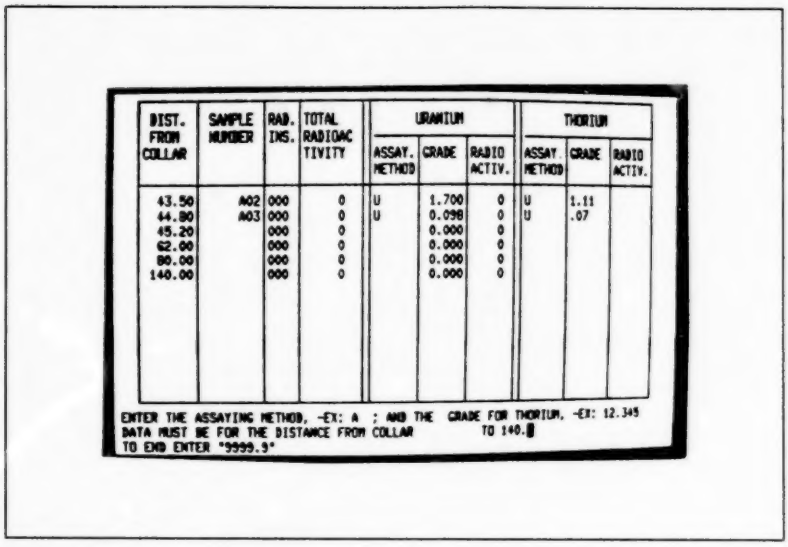

DIST. FROM COLLAR
SAMPLE NUMBER
RAD. INS.
TOTAL RADIOACTIVITY
URANIUM
ASSAY. METHOD
GRADE
RADIO ACTIV.
THORIUM
ASSAY METHOD
GRADE
RADIO ACTIV.
43.50 A02 000 0 U 1.700 0 U 1.11
44.80 A03 000 0 U 0.098 0 U .07
45.20 000 0 0.000 0
62.00 000 0 0.000 0
80.00 000 0 0.000 0
140.00 000 0 0.000 0
ENTER THE ASSAYING METHOD, -EX: A ; AND THE GRADE FOR THORIUM, -EX: 12.345
DATA MUST BE FOR THE DISTANCE FROM COLLAR TO 140.
TO END ENTER "9999.9"

Fig. (F-12i) Form *TYPEB DATA* — data entry in column pair 8 and 9

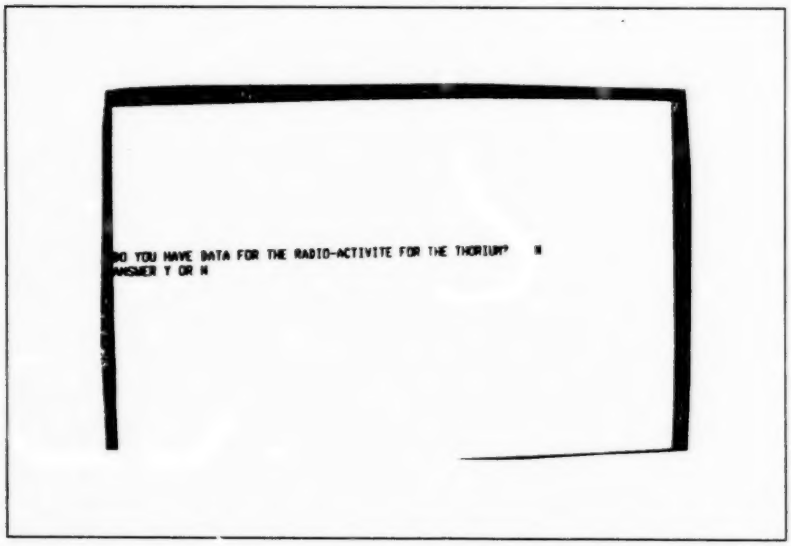


Fig. (F-12j) Form *TYPEB DATA* — selection of alternative N

Step 20: *Provision of option to continue or to interrupt the procedure*

At this point the screen displays Fig. (F-7). This example uses the alternative **N**.

Step 21: *Information identifying the form which will be displayed on the screen in step 22*

As indicated in the report at this point the screen displays Fig. 15.

Step 22: *Data entry — form TYPE = OTHER METALS*

As mentioned in *Appendix 'E'*, the user must fisrt reply to message (a) [Fig. (F-13a)]. In this example **Y** is typed in answer to message (a). Now message (b) [Fig. (F-13b)] provides an opportunity to skip lines for which no entries exist. In this example no data exist *from* 0.0 → *to* 35.0 ft from the collar. Next the existing data are entered in column pair 3 and 4 [Fig. (F-13c)]. This procedure is summarized hereunder:

(a) Message (a) for column pair 3 and 4 [Fig. (F-13a)]

(b) Message (b) for column pair 3 and 4 [Fig. (F-13b)]

(c) Data entry in column pair 3 and 4 [Fig. (F-13c)]

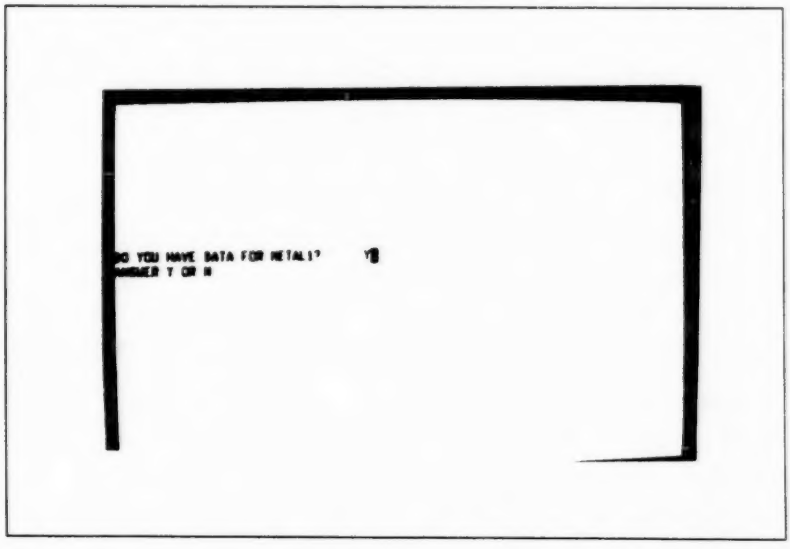


Fig. (F-13a) Form *OTHER METALS* — selection of alternative **Y**

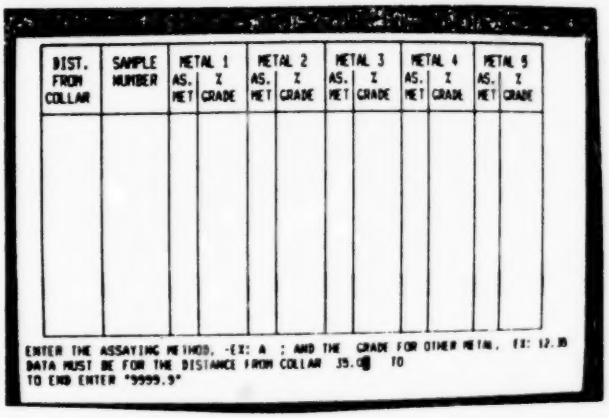

DIST. FROM COLLAR
SAMPLE NUMBER
METAL 1
METAL 2
METAL 3
METAL 4
METAL 5
AS. MET
% GRADE
ENTER THE ASSAYING METHOD, -EX: A ; AND THE GRADE FOR OTHER METAL, EX: 12.35
DATA MUST BE FOR THE DISTANCE FROM COLLAR 35.00 TO
TO END ENTER "9999.9"

Fig. (F-13b) Form *OTHER METALS* —
entry of the relevant *from* → *to Distance from Collar* lengths

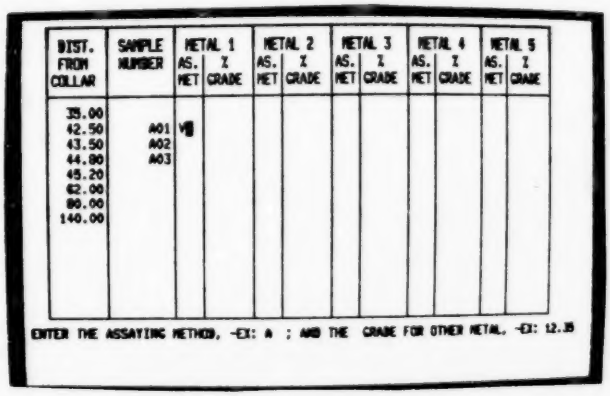


Fig. (F-13c) Form *OTHER METALS* —
data entry in column pair 3 and 4

Step 23: *Provision of option to continue or to interrupt the procedure*

At this point the screen displays Fig. (F-7). This example uses the alternative **N**.

Step 24: *Provision of opportunity to select the form that requires final corrections*

At this point the screen displays Fig. (F-14).

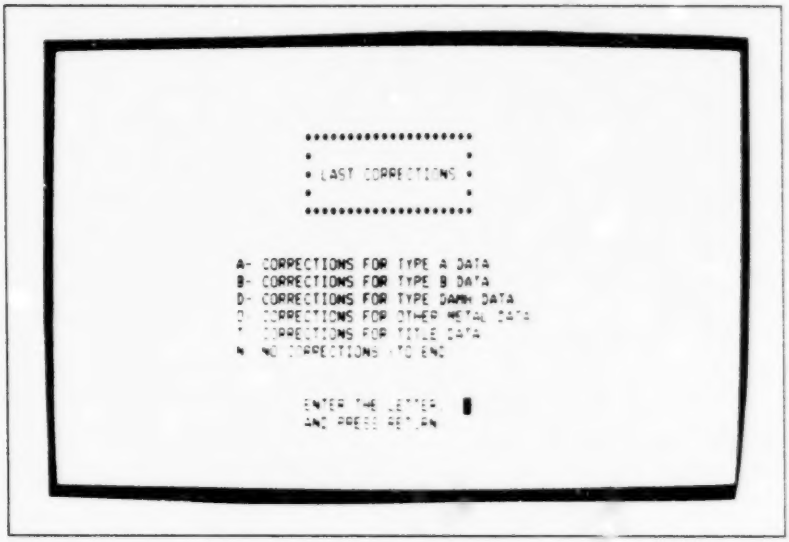

LAST CORRECTIONS
A- CORRECTIONS FOR TYPE A DATA
B- CORRECTIONS FOR TYPE B DATA
D- CORRECTIONS FOR TYPE DAMH DATA
T- CORRECTIONS FOR TITLE DATA
N- NO CORRECTIONS - TO END
ENTER THE LETTER
AND PRESS RETURN

Fig. (F-14). Selection of alternative **N**

Step 25: *Provision of options to: (a) complete a previous DH. or (b) to enter a new DH. or (c) to exit*

At this point the screen displays Fig. (F-15).

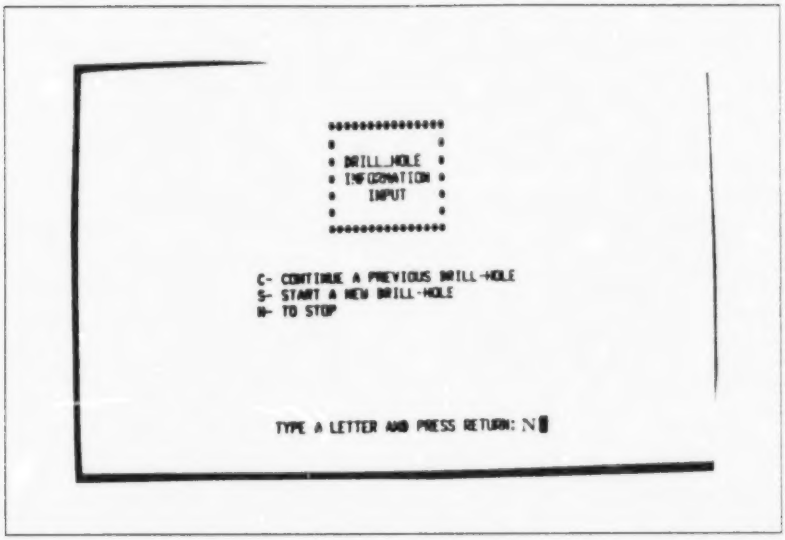


Fig. (F-15). Selection of alternative **N**

Step 1: *Accessing the program*

At this point the screen displays Fig. (F-16). Therefore, the entire data entry procedure may be repeated for another file, or the user may type **EX** or **EXIT**.

Fig. (F-16) Termination of data entry by selection of alternative **EXIT**